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The 67th Annual Meeting of the Indiana Veterinary Medical Association

Some Problems of Infertility in Cattle

Rheumatoid Disease of Swine

Recent Advances in Nutrition

Parenteral Use of Water and Salt Water

Intravenous Procaine Hydrochloride for Treatment of Pruritus in Dogs

Ramifications in the Field of Medical Mycology

Field Differential Diagnosis of Some Common Respiratory Conditions of Poultry

New Chemotherapeutic Agent to Arrest Bleeding

(Complete Index on Page VIII)

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The 67th Annual Meeting Of The Indiana Veterinary Medical Association

IN this issue of VETERINARY MEDICINE practically all of the scientific program of the 67th annual convention of the I.V.M.A. is reported. Exceptions include discussions that were primarily commentaries on motion pictures presented by Dr. Vernon L. Tharp, Director of Clinics, College of Veterinary Medicine, Ohio State University, Columbus, and Dr. A. G. Madden, Jr., practitioner, Madeira, Ohio. Doctor Tharp presented two films; one that illustrated the treatment of a number of diseases treated on the farm and in the University Clinic, and a second dealing with obstetrical cases in large animals. The color film presented by Doctor Madden was appropriately titled, A Day in the Life of a Veterinarian, and illustrated the variety of problems with which the modern practitioner deals in routine daily work. Neither of these discussions, both of which were well received, lend themselves to word pictures.

Only one of the two discussions presented by Dr. Deets Pickett, practitioner, Kansas City, Mo., is included; the other is scheduled for publication at a later date.

Dr. C. Harvey Smith, Crown Point, Ind., presided at this meeting. In his address Doctor Smith gave voice to the forces imposed on the practitioner during these trying times of indecision in political matters. He urged his listeners to plan and direct their efforts to set out clearly objectives of service.

During the opening sessions, Dr. Roy Elrod, State Veterinarian of Indiana, recounted some recent experiences with tuberculosis in swine. A cow condemned as tuberculous at slaughter was traced as originating from a disease-ridden farm. All the hogs and seven cows on this farm were positive reactors to the tuberculin test. It has been 20 years since Indiana was accredited and all the cattle have been tested for tuberculosis.

Dr. G. Robert Oldham

Dr. M. M. Coble

Dr. W. W. Garverick

The Committee on Transmissible Diseases of Swine suggested the urgent need for an effective means of limiting traffic in diseased pigs, "There is clear evidence," states this Committee's report, "that the most economically important swine diseases, such as hog cholera, swine dysentery, brucellosis, atrophic rhinitis, and many others are spread from farm to farm mainly by traffic in infected and recently exposed animals."

The treasurer's report indicated a balance substantially above that of one year ago so that at this meeting the registration fee for members was reduced from $20. to $10., and action taken to maintain this nominal fee indefinitely.

Officers selected to serve the Association for the ensuing year were: G. Robert Oldham, president; M. M. Coble, president-elect; E. W. Spieth, vice-president; and W. W. Garverick, secretary-treasurer. Doctor Oldham was the first to hold the office of president-elect cre-

ated at the 1950 meeting. He advanced automatically to the position as president. Doctor Coble served as vice-president last year. Newly elected to the Board of Directors were L. A. Clark, N. A. Turner, F. H. Brown, and Justin Jordan. Dr. Homer Carter will serve the Association as delegate to the A.V.M.A. convention in Milwaukee and Dr. George W. Gillie was designated alternate delegate.

Notes On Early History Of The Indiana Veterinary Medical Association†

J. LEONARD AXBY, D.V.M., Indianapolis, Indiana

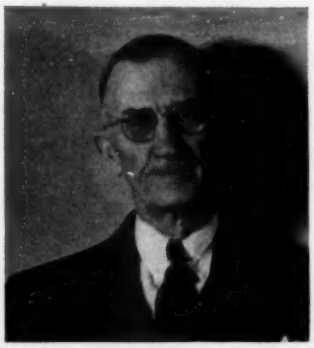
TO the best of my information and belief, the first meeting of veterinarians in Indiana was held at Marion, in 1895, at the office of Doctor Wallace. Records have been lost. One of the highlights of this meeting that is recalled to memory was the serving of the meat of a three-year-old horse which had had its leg broken the morning of the meeting. It had been dressed and prepared during the day and was served at the evening meal.

The practice of meeting in the various cities and towns of the state was continued until 1900 when the present I.V.M.A. was organized at Indianapolis. That organization meeting was held in one of the rooms in the State House with 12 veterinarians present.

Practitioners active during these early years prior to the turn of the century included four charter members of the present association, who are now living and active. They are Dr. Alva B. Carter, Attica; Dr. T. A. Sigler, Greencastle; Dr. C. P. Wilson and Dr. J. Leonard Axby of Indianapolis. As a result of the activities of this group, the Indiana Veterinary College was established.

Speakers on the programs of the early day meetings were always members of the Association. At no time was anyone out of the state of Indiana asked to participate. How vastly different the subject matter of these meetings as compared with today. Then, the principal activities of the veterinarian had to do with the horse and cow only. One of the diseases that was discussed was azoturia; other subjects, such as the treatment of nail pricks and lameness in horses were discussed. Every farmer had one or more teams and while the herds of cattle were small as compared to those of today, they were appreciated just as much and were treated daily in routine practice.

It was not until approximately 1910 that progress in cooperative efforts of the Association with livestock groups was felt. Early-day county meetings in which the local practitioner took active part were the foundation of practices of livestock disease control as they exist today.



Dr. J. Leonard Axby, CVC '03, Indianapolis, formerly State Veterinarian of Indiana and past president of the United States Livestock Sanitary Association. Doctor Axby is active in association affairs.

Practice in 1900

It was common to meet daily with some horse or cattle owner who still believed in "hollow horn" and "wolf-in-the-tail"; and almost every day we would find some owner who had split the skin of the tail, filled the incision with salt, and wrapped it up with a piece of cloth. Many times these farmers would bore a hole in the horn and then pour in turpentine as a treatment for "hollow horn."

In reference to veterinary practice, it should be interesting to tell you that in this early day there were hundreds of veterinary "quacks" in the state. In the year 1903, when I located at Lawrenceburg in Dearborn County, there were 17 so-called "quack doctors" in the area that I covered in my practice. One must not forget that those fellows were not to be condemned; they were to be lived with. Most of them were getting along in years. There were

few young fellows, but the situation was changing rather rapidly from a standpoint of appreciation of better veterinary service. Laws were quite different. Laws were passed whereby if a man, no matter who he was, had been prac-

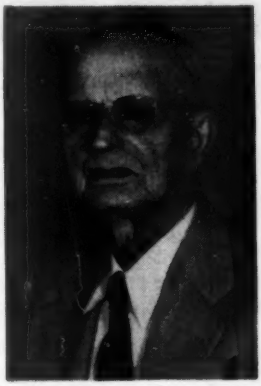
Dr. Alva B. Carter, ONT '92, will celebrate, in December of this year, his 85th birthday and 57 years of practice. Doctor Carter began his practice at Fowler, Ind., where he reports gross receipts of $8. the first day and over $1,800. the first year. He practiced in several towns in Indiana and Illinois until 1931 when he established his present location in Attica, Ind.

Little veterinary work is too strenuous for Doctor Carter today. He is proud of the fact that he attended the dam of Dan Patch when he was foaled. In reference to this event he states that the famous horse had a crooked back and that this deformity was the reason he was raced to a specially built bike. He has been a member of the I.V.M.A. since 1893 and served as president during one of the early years.

ticing veterinary medicine for five years, it was judiciously decided that that was his livelihood and one had no constitutional right to legislate him out of his business. Again referring to these men in the county of Dearborn, which applied more or less comparatively to men of other counties, we endeavored not only to live with them, but to get them to appreciate our service, and in a few years, as a result of the free contact and association, they gradually ceased practicing because of the realization that they were not qualified. Also, they were losing patronage because of better service rendered by the qualified graduate veterinarian.

The young veterinarian of today is appreciated in any community in which he may want to locate. It was vastly different in 1903. I left Lawrenceburg, Ind., as a teacher in a high school and had no difficulty in being recognized socially; but when I came back as a graduate in veterinary medicine and located in Lawrenceburg, I found myself confronted with a situation in which many of the girls who were so nice and friendly to me at the time I left, now definitely ostracized me because I was a "horse doctor." I had no difficulty, however, nor any heartbreaks. Social ostracism of veterinarians was brought about in a perfectly human and natural way because all of us translate every new thing in terms of some past experience. These girls, for instance, naturally translated me in terms of an old "horse doctor," who was intoxicated part of the time and was uncouth in his clothing as well as in his general appearance. Clean living, interest in political, social, and religious activities in his community have been responsible for the change in public attitude toward the veterinarian, which is now enjoyed by young men entering the profession.

Features of early day practice were the long, time-consuming drives. Most roads were dirt.



Dr. Claude P. Wilson, IND '95, 1503 Park Ave., Indianapolis, at 82 years of age is conducting an active mixed practice and is the official representative of the Indiana State Livestock Sanitary Board at the Indianapolis Stock Yards.

There were few free gravel roads, with some paved or graveled toll roads. In the early years of my practice it was not unusual to be absent for as long as four days and nights. Frequently the only rest during this period was in a buggy or on hay while waiting in the barn or the home of the owner. Now, the horse has practically disppeared; the old turnpike and the toll gates are only memories. I have still in my possession five shares of stock in a toll turnpike in Dearborn County, which was owned by my father.

With these remarks on some of the early history and activities of the veterinarians of the first decade of the 20th century, contrast with present day activities is astounding. When we think of the early beginnings of this association, meeting to discuss the problems of nail

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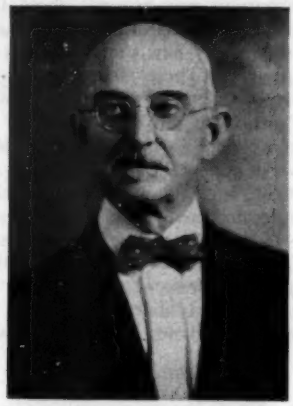
pricks in horses and their treatment, and contrast this with the scientific discussions presented this year that pertain to problems of medical mycology, the use of curare in surgery, intramedullary pinning, hormone therapy in reproductive disorders, nutrition in relation to disease control, and other classical procedures, one has a glimpse of progress beyond the wildest dreams of the founders.



Dr. Thomas A. Sigler, IND '02, Greencastle, practitioner, lecturer and author. He served as president of the A.V.M.A., 1926-27 and is active in practice and association affairs.

▼ ▼ ▼

Swine Brucellosis Control*

Although the fundamental principles of brucellosis control and eradication in cattle and swine are similar, the essential differences in the infection as it occurs in these species of livestock must be considered when planning effective control measures. From an economic and public health standpoint, all concerned are interested in control of brucellosis, irrespective of the species involved.

Swine brucellosis is a serious herd infection from both an economic and public health standpoint. Much brucellosis infection in man is of swine origin. The disease has been one of our most difficult problems, due in part, to the fact that no single plan of attack has proved successful under widely different conditions. Confusion has resulted, followed by unwillingness to recognize merits of any proposal. No hard and fast rules and regulations can be made without being tempered by studied consideration of the local situation and the application of good judgment.

Enough information is available on which to base plans that promise a degree of control sufficient to justify encouragement by members of the profession that swine raisers adopt official plans of control and eradication of this disease in swine.

Diagnosis of Infection

The serum agglutination test is the backbone of the entire brucellosis control and eradication program in both cattle and swine. In cattle, long usage has shown the reliability of the test in selecting infected individuals capable of transmitting the disease to susceptible animals. Agglutination titers persist in cattle once infected and interpretation of the diagnostic test is well understood. Swine present a different problem because the serum agglutination test is not dependable in selecting infected individuals. Three limiting factors are; (1) the absence of blood agglutinins in the early stages of the disease in some hogs, (2) transient low titers in both infected and apparently healthy animals, and (3) the disappearance of titers in some infected swine. In consideration of these factors, considerable reliance can be placed only in negative reactions of all animals in the breeding herd. If, however, reactors are present, negative animals should be viewed with suspicion.

A further complicating factor is recession of agglutination titer and lack of symptoms in swine previously infected or which have aborted. Such animals may be the source of infection in susceptible gilts or sows.

Eradication of the Infectious Agent

Regardless of type, all Brucella infections are destroyed by the same agents. Common premise management is effective. Elimination of infected animals presents a problem in swine because of inaccuracy of diagnosis. It is recommended that the entire herd be segregated and isolated from their offspring or sold for slaughter, rather than merely eliminating reactors as is the practice in the case of infected cattle.

The role of the breeding male, both bull and boar, is extremely important in brucellosis control. The bull is responsible for spread of infection, but is considered to be less of a factor than the boar. Infected boars commonly eliminate Brucella in the semen in tremendous concentration, and have been shown to be potent spreaders of the disease under field and experimental conditions.

▼ ▼ ▼

A.V.M.A. 88th annual meeting Milwaukee Wisconsin, Aug. 20-23, 1951.

*Abstract of paper presented by Dr. L. M. Hutchings, D.V.M., Ph.D., Head, Department of Veterinary Science, Purdue University, Lafayette, Ind., at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

Some Problems Of Infertility In Cattle*

E. A. WOELFFER, D.V.M., Oconomowoc, Wisconsin

REPRODUCTIVE failures in cattle are of far greater significance than is generally realized. Delayed conceptions and abortions bring about reduced calf crops, increase cow depreciation and decrease milk production. University of Wisconsin authorities have estimated that the losses in milk production alone due to infertility in Wisconsin cattle amount to over $28,000,000. annually. Equally significant estimates on losses from infertility have been reported by authorities in other states.

Brucellosis Only a Part of the Picture

Brucellosis remains one of our important diseases of reproduction. This disease, however, has corralled our interest for so many years that the overall picture pertaining to reproductive problems has been distorted. In this discussion, it is not desired to minimize the seriousness of brucellosis, but to focus attention upon other important reproductive diseases. Elimination of bovine brucellosis will not cause any sudden disappearance of problems of infertility.

Greater Attention is Focused on Infertility

Artificial insemination and accelerated programs in research, particularly with endocrine products, during recent years have stimulated greater interest in the problems of reproduction. Better feeding and breeding are slowly but surely producing more valuable cattle. In order to protect their greater investments, breeders are exhibiting increasing concern over the general and reproductive health of their herds. This situation establishes a new challenge to the veterinary profession, which can be met successfully through cooperation and service, together with the continuation of an enlarged, effective research program.

It is desired to emphasize, briefly, some of the problems encountered by the practitioner and specialist in reproductive disorders. Infertility in cattle, like mastitis, is primarily a herd problem. Whether called upon to make examinations on a few animals or all the breeding females and males, it is advisable to make a rapid but careful survey of the entire herd. The general condition and health of the animals should be observed and at the same time feeding program should be checked. Next, find out what the status of the herd is relative to brucellosis. Also, attempt to determine the presence or absence of other venereal infections through evaluation of abortions, if any, delayed breedings, vaginal discharges and other external signs of irregularity. What about the calf and heifer crops? How many are there and what is their condition? Do not overlook the bulls. Ask about their behavior, their breeding and management routine and look over their breeding records. If accurate or adequate records are not available, point out the importance of good records. Simple records are usually best since they are most apt to be kept up-to-date. Poor records, however, are not much better than none at all. Many breeders are interested in relatively complete records and this practice should be encouraged.

Dr. E. A. Woelffer

Nutrition and Reproductive Failures

In the light of present knowledge, progressive dairymen and breeders of beef cattle do a commendable job of feeding. If the feeding program includes abundant pasture and a generous supply of green, leafy legumes, supplemented with concentrates for satisfactory growth and production, and the animals ap-

*Presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

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pear thrifty, there is probably little reason for suspecting nutritional deficiency as a cause of infertility.

It is undoubtedly true that for purposes of perpetuating the species, nature provides the nutritional requirements of the fetus ahead of the needs of the dam. If the diet is deficient over a prolonged period, as for example in times of drought or nutritional deficiency, the dam's body tissues become deficient before the fetus is affected. Perhaps this same conclusion can be reached regarding ovulation, fertilization and fetal implantation. The facts are not at hand, but it is reasonable to assume that these processes will continue to function at near normal levels, even under adverse conditions.

However, the fact cannot be overlooked that some of our highly developed dairy cows become unbalanced in hormone ratios as a result of living under geared-up, man-made environments. Undoubtedly deficient or unbalanced diets have a part in bringing about these conditions. Before a satisfactory determination can be made of the full effects of nutrition upon infertility, more information is required on the composition of plants as influenced by weather, soil, methods of storage, etc. The vital requirements of vitamins, minerals, and other nutritional factors need further study and elucidation before any definite conclusions can be advanced on their relationship to reproduction.

Inheritance and Infertility

Evidence is available that inheritance influences fertility. In some high producing herds, inheritance appears to influence reproduction, yet too little information is available upon which to draw conclusions. Certain lethal characteristics have been reported traceable to inheritance, mostly from inbreeding. The underlying cause of cystic degeneration (nymphomonia) of the ovary, for example, is still vague, yet there is substance in the belief that inheritance takes a part in it. The same may be true of other endocrine disturbances. A great deal has been learned about endocrinology during recent years, particularly with regard to correcting unbalanced conditions, but more information is needed on causes and prevention, as well as on treatment. Through selective breeding, livestock men have made great strides in improving their stock. But through their zeal to improve the more obvious characteristics of production, test, type, etc., some breeders have failed to improve such qualities as resistance to disease or the development of adaptable animals having stable nervous systems and good functional endocrine balance.

Examination of the Individual

As the cow is approached for individual examination, a rapid survey is made, particularly with reference to age, and general condition of the individual compared to the rest of the herd. Learn the stage of lactation and something about past general health. History of metabolic disease such as acetonemia, or infections such as nephritis, should be obtained, as well as any other medical or surgical history. Many of these anomalies frequently interfere with normal estrus and ovulation.

Take note of the external pelvic region and the vulva. Is the vulva swollen or thickened, injured, tipped forward or patent? A swollen, slightly reddened vulva may be an indication of infection. It may denote the presence of cystic ovaries or be a sign of impending abortion, heat, or normal termination of gestation. A vulva that is tipped, and particularly one that remains open, perhaps from injury, permits particles of feces to fall into the vagina, which has a tendency to keep infection active. There are cows in which the vagina tends to balloon and thus expose the reproductive tract to infected material. These animals often prove difficult to get with calf. If there is a discharge, note the color, the consistency, and the amount, and if possible, determine its source. The purpose of these observations is to aid in establishing an accurate diagnosis.

The next step is important and regardless of any reports or records, do not manipulate the ovaries or even pronounce the cow sterile until it has been definitely established that she is not in calf. In most cases, pregnancy can be definitely determined in 30 to 40 days. At 33 days, the blastoderm is about the size and shape of a small marble. At 50 days, it is still quite round but increased to the size equal to that of an English walnut. The corpus luteum may be palpated on the side of the pregnant horn. It is important to distinguish between pyometra and pregnancy. The most likely time for error is between four and five months after breeding. Make a record of each examination. It will be found valuable in many ways. Usually a carbon copy is left with the owner.

The Open Cow

If the cow or heifer is not pregnant, quickly but carefully examine the cervix, ovaries, uterine horns, etc. If there are adhesions in the region of the ovaries, check the fallopian tubes for adhesions or thickenings. If adhesions exist

and both ovaries and oviducts are involved, one is justified in classifying the individual as permanently sterile. Fortunately, it will be found that there are only a small number of females in such condition. Most shy, or so-called difficult breeding cows, do not conceive because there is some form of interference with ovulation, fertilization, implantation, or there is resorption or abortion of the fetus. Mostly the condition is a temporary one. With proper treatment, the cow sooner or later returns to normal breeding condition.

Most cows have a relatively normal reproductive tract, come in heat regularly, conceive readily when properly inseminated or bred to a fertile bull. A common cause of infertility is failure to observe cows in heat and breeding them at the proper time. Unless a herdsman is well trained, he will miss some normal heat periods, and thus delay the process of getting cows in calf.

In winter when cows are in stanchions, it is advisable to turn them into a yard or paddock for a short while, preferably twice daily. Open heifers and cows on pasture should be carefully observed several times a day.

When a cow fails to conceive, a corpus luteum (CL) of estrus forms on one of the ovaries. When everything goes well, the corpus luteum is resorbed in 16 to 18 days and a graafian follicle develops; the cow goes into estrus and the follicle terminates in the release of the ovum. Sometimes cows fail to show heat. The cause is not known except that the follicle stimulating hormone (FSH) is low in proportion to the luteinizing hormone (LH). The result is a pituitary-gonadotropic-ovarian imbalance.

The Corpus Luteum of Estrus

If the cow fails to show heat and a corpus luteum is present, it may be removed manually, or an estrogenic hormone, preferably a natural product, may be employed. Small doses (5 mg.) repeated daily for two to three days, or 10 to 25 mg. in a single dose, are usually sufficient to induce estrus. If follicles are present and a corpus luteum absent, it is advisable to determine first if the animal is in heat or in a state of quiesence. If the female is not in heat, a luteinizing hormone may be administered. Ten units of pituitary gonadotropin injected intravenously, or 1,000 to 4,000 units of chorionic gonadotropin (CG) intravenously, or 10,000 units intramuscularly, may be administered. Pregnant mare's serum, 500 to 1,000 units subcutaneously, is quite effective when the ovaries are hard and firm and do not contain follicles. Doses may be repeated or increased in stubborn cases. If gonadotropins are given intramuscularly, larger doses are recommended. If large doses (5,000 to 10,000 units) of chorionic gonadotropin are given intravenously, it is advisable to administer 5 to 8 cc. of epinephrin hydrochloride to prevent allergic reactions. Reactions from pregnant mare's serum may also occur. Gentle massage of the ovaries is usually in order as a supplementary treatment.

Cystic Ovaries

Frequently follicles do not ripen or rupture normally. Such cases are observed in heavy producing cows or highly conditioned beef cattle. Cysts may develop on one or both ovaries. The estrus cycle is irregular in these females and usually occurs at frequent intervals. Left untreated, the cysts undergo degeneration, the condition becomes chronic, and the cow takes on secondary male characteristics and remains almost constantly in heat (nymphomania). The output of estrogenic hormone is out of proportion to the luteinizing hormone. Treatment consists of: (1) removing, manually, one or more cysts to reduce estrogenic secretion; and (2) intravenous injection of 10 rat units of anterior pituitary extract or 10,000 units of chorionic gonadotropin intramuscularly. If the latter is used intravenously, 5,000 units may suffice or 10,000 units may be given in divided doses, half intravenously, half intramuscularly. Precautionary measures against a reaction should be taken when this product is administered intravenously. Treatment may be repeated in 30 days.

Retention of the Corpus Luteum

Retention of the corpus luteum is a fairly common condition. It is often difficult to distinguish between a retained corpus luteum of estrus and a corpus luteum of pregnancy. If a corpus luteum of pregnancy is present and the female is not in calf, it may mean one of several things. An embryonic abortion may have taken place with or without uterine infection, there may be imperfect follicular development, cystic degeneration of the corpus luteum, or mummification of the fetus may have occurred.

If inflammation is present in the region of the ovary, as is often the case in cystic degeneration of the corpus luteum, refrain from manipulating the ovaries until after a short rest period and after treatments of the uterus and cervix have been administered. Adhesions in the region of one or both ovaries are sometimes present also.

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Cystic degeneration of the corpus luteum may be confused with cystic degeneration of the ovary. However, with experience, these can be palpated without difficulty. Furthermore, abnormal heat (nymphomania) is absent. If the cystic corpus luteum is to be extirpated, manually remove diseased portions as well as the healthy tissue. Care must be exercised in removing all corpora lutea, but particularly those that are cystic, since they have a tendency to bleed easily. Unless they "peel out" readily, it is best to resort to other treatment.

A recommended routine treatment in these cases is: (1) Infuse the uterus one or more times and breed on the first normal heat. All traces of abnormal discharge should be absent. (2) After breeding, inject intramuscularly, 5,000 units chorionic gonadotropin and repeat the dose in 48 hours (2,000 to 4,000 units administered intravenously may be used instead). Thyroid for pituitary stimulation may be provided daily for a period of two weeks following service. Three grains daily is considered a suitable dose.

If early abortion or fetal resorption appears to be due to hormone imbalance or inadequacy, not less than the equivalent of 50 mg. of progesterone daily may be supplied. More information is needed in the diagnosis and treatment of these cases.

Infection

Reproductive infections other than brucellosis cause considerable loss through abortions and delayed breeding. The most common are trichomoniasis and invasion of *Vibrio fetus*. Non-specific infections, ranging from mild catarrhal metritis to more severe forms involving almost the entire reproductive tract, are not uncommon. Uterine infusions with antibiotic or mild non-irritating antiseptics have been found useful not only in those cases where the organ is filled with mucopurulent secretions, but in those that reveal little or no pathology or abnormal secretions.

Solutions that have been successfully employed for this purpose are mild Lugol's solution, aqueous tyrothricin, acriflavine, hexylresorcinol (caprokol), sulfonamides in oil or in aqueous solution, crystalline penicillin, or combinations of antibiotics. These may be infused into the horns of the uterus at any time during the anestrus period, preferably 72 hours before service. A volume of 25 to 40 cc. of the oily preparations are usually employed, whereas from 50 to 250 cc. of the aqueous forms have been used successfully. Often it is advisable to infuse the uterus while the animal is in heat. From 100,000 to 300,000 units of sodium penicillin in 10 to 20 cc. sterile distilled water may be used in the morning and the animal bred in the afternoon. Streptomycin, preferably dihydrostreptomycin, has also given good results in such treatment.

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Swine Erysipelas*

The "hide in the bedding" history is the most constant reported in erysipelas-affected swine droves. Closer observation of infected animals reveals a characteristic stiffness in gait. The pigs seem to creep, fetlocks are half flexed and backs are humped. Urticarial wheals are diagnostic and edema of the extremities, including legs and ears, has been thoroughly discussed, as have been autopsy findings of adhesions and kidney changes.

The symptoms and disease processes observed in swine erysipelas infections are not constant. Variations occur in different herds and under different types of management; they also vary in different locations in the Corn Belt. A paradox exists in the not uncommon experience in which pigs nursing sows up to, and even after death due to infection with the erysipelas organism, remain healthy without treatment. Unpredictable contagiousness is a characteristic feature of this swine disease.

In the routine practice of the speaker, temperature readings are considered of particular significance. As temperatures are taken they are noted on the backs of the animal, applied with a mercurochrome swab or marking crayon. This records the degree or severity of infection and makes possible opportunity to check progress of individual hogs.

Duration of immunity expected after the vaccination of pigs with erysipelas culture and serum is limited. It is dependable for approximately four months only. In consideration of this factor, it may be appreciated why costly losses due to erysipelas infection occur shortly before marketing age and weight in vaccinated hogs which are thought to be immune. On farms where erysipelas has occurred in previous years and where it may be desirable to protect growing animals, vaccination is done approximately three weeks after serum-virus immunization for hog cholera. On this schedule, immunity to erysipelas is more likely to protect animals during the growing and fattening periods.

*Notes taken from an address by W. A. Aitken, D.V.M., Merrill, Iowa, presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

Rheumatoid Disease Of Swine†

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THE pathologic condition in swine which we are calling rheumatoid disease is not new. The thing that is new is the viewpoint from which we are considering a malady which has existed for a long time. The importance of what is here called rheumatoid disease is generally recognized. A good many hog growers find it difficult at times to grow hogs profitably because the animals develop rheumatoid conditions. Damage done in affected herds is extremely variable; and the occurrence or recurrence of the disease is unpredictable.

In some affected herds, less than 1% of the animals show clinically recognizable evidence of the disease. In an occasional herd, more than 10% of the animals may be seriously affected. The variability in the incidence within affected groups is indicated by the following herd histories: In one herd, which has been under close observation for several years, one fatal case occurred five or six years ago. Since that time, 600 to 800 hogs have been marketed per year from that herd without significant loss from rheumatoid disease. In another herd of 400 hogs, 40 became so seriously affected during one year as to be considered worthless. In addition, many other animals in this herd were definitely damaged. In still another herd, rheumatoid disease occurred annually on an important scale for several years and then disappeared for some unexplained reason.

Morbidity and Mortality

Death losses are usually low but stunting and unthriftiness are important effects. Deaths that do occur are usually sudden. No symptoms may have been noted before death. In some instances, however, several animals in the herd are visibly sick; and in rare cases the death loss may reach or exceed 10% within a few days.

Symptoms of Rheumatoid Disease

The clinical manifestations are variable. In some acute cases the body temperature may reach 108 F. Some acute cases show surprisingly few symptoms other than elevated body temperature; and they sometimes make spectacular spontaneous recoveries. Usually there is more or less evidence of soreness or stiffness, suggesting arthralgia or myalgia. Some affected animals are unable or unwilling to walk, probably because of painful joints or muscles. A severe, shifting lameness is sometimes seen. At times it may be difficult to distinguish between this type of lameness and that which results from bone fracture.

The skin manifestations correspond, at least roughly, with some of the skin conditions which occur in association with rheumatic or rheumatoid diseases in man. There may be circumscribed erythema or the reddening may be diffuse, particularly on the under side of the body. Some areas in the skin may become indurated and later necrotic, followed by sloughing. Occasionally the reddening of the skin assumes an annular or ringed form somewhat like the so-called erythema annulare rheumaticum occasionally seen in the human family. Subcutaneous nodules sometimes occur. They may have an appearance and a duration suggesting that they are urticarial in nature.

In fully developed chronic cases, joint manifestations are the most conspicuous evidence of the disease. Joints are enlarged due mainly to fibrotic periarthritis. However, there may also be bone changes with more or less exostosis. Enlargement of the carpal joint is usually somewhat symmetrical, giving that portion of the leg a spindle-shaped appearance. The tarsal or hock joint often shows more enlargement medially than laterally. There may be ankylosis, either fibrotic or bony. The degree of ankylosis probably has a good deal to do in determining the impairment of the legs. Disability of the limb may also be influenced by pathologic changes within the joint.

Lesions on the Viscera

The visceral lesions are sometimes easily seen. However, the most important ones are often difficult or impossible to detect by gross examination. In some cases, it appears accurate to say here what is said regarding rheumatic fever: "It licks the joints but bites the heart." At any rate, extensive damage is often found on microscopic examination of the

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heart. Marked gross heart lesions are occasionally found in the form of fibrinous or fibrous pericarditis and epicarditis. There may be extensive adhesions between the visceral and parietal layers of the pericardium. Sometimes a grossly recognizable myocarditis is present. In rare instances, massive vegetative formations, "cauliflower growths," are found on and near the auriculoventricular valves, particularly the bicuspid. Similar formations may also occur on the semilunar valves. Enlargement of the heart is likely to occur in cases where there is valvular involvement. Microscopic examination often reveals an extensive myocarditis or pancarditis which may escape detection on gross examination. In cases where there is vegetative endocarditis it is common to find evidence of infarction in various organs, particularly in the kidneys. Pleuritis and peritonitis occur in some cases.

Joint Lesions

The joint lesions consist mainly of increased connective tissue in and around the joint capsule, together with marked hypertrophy and hyperemia of the synovial villi. These hypertrophic and hyperemic synovial villi may largely fill the joint cavity. These changed villi are sometimes inappropriately called verrucae. The presence of these hypertrophic, vascular villi in the joints probably accounts for some of the lameness that accompanies rheumatoid disease. The joint fluid is usually moderately increased in amount, and is often cloudy. Fibrinous exudate is fairly common in affected joints. The articular surfaces are often markedly affected. The cartilage is pitted or eroded and there is often considerable distortion of the articular surface and the adjacent portion of the bone. A few cases have been seen in which the head and neck of the femur were separated from the shaft and false joints had been formed. Occasionally exostosis occurs in the enlargement at the joint. Bony ankylosis has been observed rarely.

Rheumatoid Disease—Swine Erysipelas

No doubt you have already recognized the similarity between the disease or diseases described here and swine erysipelas. Consequently you may wonder why the name rheumatoid disease is used instead of swine erysipelas. The chief reason for using the name rheumatoid disease is because these pathologic changes in swine bear some resemblance to what occur in rheumatic or rheumatoid diseases in man. Moreover, it appears highly advisable to critically re-examine the evidence on which are based our ideas and beliefs as to the specific cause of what is called swine erysipelas.

There is general agreement that it is difficult to cause disease in swine by administering cultures of *Erysipelothrix rhusiopathiae* in ordinary ways. It is difficult to find recorded in the scientific literature instances in which the disease has been consistently reproduced in swine by this means. The recorded work of Löeffler, the discoverer of *E. rhusiopathiae*, does not convincingly show this micro-organism to have ability to cause disease in swine. Numerous investigators have tried unsuccessfully to produce the disease by injection of swine erysipelas organisms. Many of these unsuccessful attempts are not recorded in the literature. The writer has failed to cause significant disease in swine with cultures. These trials have extended through several years; and have been made with strains of the organism that were pathogenic for pigeons and mice. It should be said that a few writers have reported success. Fortner and Dinter reported success in infecting hogs. While these two authors report success, many others report failure in attempts to infect swine. Doyle, of England, cites reports of ten different groups of investigators in different parts of the world who found it difficult or impossible to infect hogs with cultures of *E. rhusiopathiae*.

Since so much difficulty has been encountered in causing disease in swine with cultures of *E. rhusiopathiae*, one is justified in entertaining doubts about what we have been taught regarding swine erysipelas. The history of diseases records many errors in ascribing etiological roles to bacteria. For years, human influenza was mistakenly thought to be caused by the so-called influenza bacillus. Psittacosis or parrot fever was erroneously believed to be due to a paratyphoid or Salmonella organism. Progress toward a correct understanding of dog distemper was long delayed because it was generally believed that a Pasteurella organism was the cause. Perhaps the most important example of error in ascribing the cause of a disease to a bacterium is the familiar one of hog cholera. It may be recalled that more than 20 years were required to recover from the mistake of ascribing hog cholera to infection by a bacterium now known as *Salmonella choleraesuis*. It may be even more pertinent to note that the etiological role of streptococci in rheumatism in human beings is now seriously questioned or entirely disbelieved by some of the ablest investigators.

If what is being called swine erysipelas were considered to be rheumatoid in nature, we may

soon make important progress toward a scientific understanding of the condition or conditions. Research workers have already reported finding filtrable agents associated with at least some of the rheumatoid manifestations generally attributed to infection by *E. rhusiopathiae*. McNutt and coworkers found a filtrable agent in pigs suffering from arthritis. Köbe isolated a filtrable virus from pigs which had what was called swine erysipelas.

As practitioners, you are properly concerned with the problem of how to handle affected herds. There apparently is no very effective practical treatment for arthritis after it has developed. We have made limited trials with some sulfonamides and antibiotics without obtaining appreciable beneficial results. Of the antibiotics, penicillin, aureomycin and streptomycin were tried with what we consider negative results.

There are persons of course, who believe that preventive vaccination is effective. This method of control is based on the belief that the swine erysipelas organism is the specific cause. Apparently very few, if any, well controlled tests have been made to determine the effectiveness of preventive vaccination, consequently it is difficult to evaluate what has been presented as evidence.

Careful and adequate feeding, together with proper management of an affected herd, will reduce the economic loss. Animals which are affected to such a degree that they are hopeless may as well be disposed of early so as to avoid needless expense. Sometimes the point is reached where it is wise to dispose of the entire herd and then restock from a healthy source.

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Early Diagnosis of Freemartin†

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A heifer born twin to a bull is not an uncommon occurrence. A varying percentage of these heifers prove to be fertile females. Early diagnosis of such females by the practitioner renders a valuable service to the cattle breeder. The late Dr. W. L. Williams classified the freemartin heifer as a monstrosity without internal genital organs. Instead, there is usually a urogenital sinus, a vulva and often a prominent clitoris. In rare instances, one functional ovary is present or an infantile uterus without a cervix or vagina may be present. Externally the freemartin calf or young heifer may exhibit a peculiar wrinkling of the skin in the region of the vulva. The vulva, as a rule, appears swollen and paler in color with a thicker and longer tuft of hair. The teats of the undeveloped udder may be extremely small and sometimes are inverted.

The method employed in making a vaginal examination with speculum and light is demonstrated by Dr. E. A. Woelffer, Oconomowoc, Wis.

The method developed by Dr. M. G. Fincher for diagnosing the freemartin at an early age has been found useful and easy to apply. Use a 4-in. tube with a diameter of about ½ in., into which has been inserted a short milking machine tube. The glass tube is lubricated and inserted through the vulva opening into the vagina. If the animal is a true female, the tube can be inserted approximately 6 in. In the neuter, the tube can be inserted only to a depth of 3 to 3½ in. The presence of a hymen or an extremely tight constriction at the vulva-vaginal area may confuse the operator and lead to a wrong diagnosis. In such cases, it is advisable to use a small speculum and light. The presence of a normal external os uteri is good evidence that the heifer will probably develop into a normal female.

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In trials at the College of Veterinary Medicine, University of the Philippines, Quezon City, Murriel and Gonzoga report that neither penicillin nor streptomycin appeared to promote longevity of spermatozoa in treated samples of bull semen. Controls in their experiments retained their viability the same number of days or longer than treated samples.—*Phil. Jour. An. Ind., 10:389, 1949.*

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Recent Advances In Nutrition As They Apply To The Veterinarian†

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ANIMAL nutrition is of primary concern to those interested in the maintenance of livestock health. The resistance to disease of the well nourished animal is known to be superior. Obviously, in a limited discussion, only a few nutrition "subjects" can be reviewed and the following remarks will be confined to (1) vitamin B_{12}, (2) antibiotics, (3) nutrition during gestation, and (4) B-complex vitamins.

Vitamin B_{12}

Within the past decade, extensive experiments have been conducted demonstrating that the animal protein factor (APF, so-called because it was first associated with animal products) is essential for maximum growth, feed efficiency, and health in livestock production. The term APF has become obsolete because of the misleading connotation that it is protein in nature. Actually, APF is more vitamin-like in nature because of the minute concentration of the product required to exert a stimulatory or beneficial effect. The present day concept is that APF, a biofermentation product, can be tentatively fractionated into three nutritional components: (1) vitamin B_{12} (known as "antipernicious anemia factor" or "cow manure factor"), (2) antibiotics, and (3) other unknown nutritional factors. Present feed control regulations classify or define the APF products as a B_{12} feeding supplement, an antibiotic feeding supplement, or a B_{12}-antibiotic feeding supplement, depending upon the guaranteed concentration of B_{12} and antibiotic content.

Experimental evidence at hand indicates that vitamin B_{12} plays an important role in the stimulation of growth and hatchability of chicks, in the improvement of appetite, in the growth and reproduction of swine, in the prevention of certain types of anemia, and in the sparing of methionine for certain body functions. The mode in which the effect is accomplished by this new vitamin is not clear.

The B_{12} activity of all food products has not been determined. In fact, only a good start has been made on determining potential sources. Fishmeal, liver and glandular products, fish solubles, meat products, milk products, and cow manure are some of the richer natural sources of B_{12}, while the grains, grain by-products, and plant protein concentrates are the poorer natural sources of this vitamin. Even among the rich natural sources, there is considerable variation in the B_{12} activity, which is probably the result of processing methods and raw material used. On the market today are many commercial feeding supplements produced by biosynthesis from waste products of antibiotics, such as streptomycin, aureomycin, terramycin, and others.

Antibiotics are widely distributed in nature. A few familiar ones, which have become prominent in the medical and animal nutrition fields are penicillin, streptomycin, aureomycin, terramycin, chloromycetin, bacitracin, subtilin, and others. These products have been produced by controlled fermentation processes of certain molds and bacteria. A number of naturally occurring substances have also been isolated from green plants, such as red clover, wheat, tomato, cabbage, etc. Various microorganisms that produce antibiotics have been isolated from the soil.

Vitamin B_{12} is not a new factor in animal nutrition. For years, swine producers have been supplementing grain rations with animal proteins which contained variable amounts of B_{12} and perhaps other unknown factors. Undoubtedly the vitamin activity of high quality meat protein supplements was one of the major contributing factors for increased growth performance of pigs on rations containing animal protein.

In an experiment, it was demonstrated that the addition of 0.5% of a B_{12} supplement (equivalent to 1 mg. of vitamin B_{12} activity per 100 lb. of total ration) to a corn-soybean meal-alfalfa meal ration fortified with minerals, cod liver oil, and six synthetic B vitamins, improved growth rate. In the paired feeding experiment in dry lot, litter mate pigs fed the supplement gained 0.42 lb. more per day dur-

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ing the 105-day experiment than the controls. In a second experiment, essentially the same basal ration was fed, but on a group basis. Pigs receiving the supplement gained significantly faster on less feed, compared with the control group. Gross symptoms of a B_{12} deficiency were characterized in certain pigs by labored breathing, marked unthriftiness, and a general anemic condition. The blood picture revealed a severely reduced hemoglobin level and red blood cell count. This agrees, in part, with medical research demonstrating that vitamin B_{12} and other nutritional factors are essential for normal hematopoiesis.

Antibiotics

Shortly after B_{12} had become identified as the probable animal protein factor for growth, many workers suggested that there were additional factors, because of their laboratory observations that certain APF products exerted greater growth stimulation than others. In March 1950, workers at the University of Florida and the Lederle Laboratories originally showed that the antibiotic, aureomycin, stimulated the growth rate of pigs fed a corn-peanut meal ration fortified with B_{12}. At approximately the same time, investigators at the Michigan station demonstrated a significant growth response from adding another antibiotic, streptomycin, to a corn-soybean meal ration well supplemented with minerals and vitamins, including nicotinic acid, riboflavin, and calcium pantothenate.

At the Purdue Station this past summer (1950), the supplementary effect of aureomycin, and B_{12} were tested on a large group of weanling pigs when added in various combinations to a practical hog ration of corn, soybean meal, alfalfa meal, vitamins A and D, plus nicotinic acid, calcium pantothenate, and riboflavin. In one feeding trial, the Duroc pigs on the basal control ration gained 1.62 lb. daily with a feed requirement of 392 lb. per 100 lb. gain. The addition of 15 mg. pure streptomycin base per lb. of total feed increased the average daily gain to 1.80 lb. (11% increase over the basal rate) and reduced the feed requirement to 334 lb. per 100 lb. gain (14% decrease). The addition of 10 mg. aureomycin per lb. of total feed increased the rate of gain to 1.85 lb. daily and reduced the feed requirement to 322 per 100 lb. gain. The addition of B_{12} to the rations containing streptomycin or aureomycin improved the growth significantly over the basal but only slightly over the ration containing the pure antibiotics.

In a parallel pig experiment involving 80 Duroc pigs fed various supplements of the APF complex in a basal ration similar to the one above, a combination of B_{12} and streptomycin was more effective in stimulating growth and improving feed efficiency than either one fed singly. This is similar to the finding in chick rations that B_{12} must be present in order to produce maximum antibiotic growth stimulation. Perhaps the slight stimulating effect of this B vitamin in the presence of the antibiotic in the first pig trial, compared with the second pig trial, may be attributed partly to the greater reserve storage in the heavier pigs used at the start of the first experiment. It was also shown that the 15 mg. level of streptomycin per lb. of total feed was more effective than the 2.5 mg. level.

Pigs fed antibiotics were more uniform in their growth response, exhibited greater appetites, and showed some protection against a certain type of scours. Blood dysentery developed in the two basal lots, while the supplemented lots did not develop symptoms even when exposed to the infection for four weeks. The infected lots responded exceptionally well to oral feeding of 1 gm. of aureomycin or streptomycin per pig, added to the protein supplement for the first day and 0.5 gm. per pig the second day. The Iowa station has recently reported that continuous feeding of aureomycin or streptomycin in a practical pig ration reduced scouring in pigs challenged with the virus of transmissible gastroenteritis. In another test, the Iowa workers observed that slow-growing "runt" pigs fed aureomycin were more uniform in size, more thrifty in appearance, and less subject to scours than pigs on the basal ration.

The theory that antibiotics may function in part as anti-infective agents is further supported by recent reports of poultry studies that feeding antibiotics reduced the concentration of *Clostridium welchii* in the intestinal tract. More research is needed to determine prophylactic and therapeutic levels of different antibiotics and the protective effect of continuous oral feeding of these agents against various types of infection of the intestinal tract. Other questions, from a nutritional standpoint, remain unanswered at the present time. As yet it is not known what the long-time effect of feeding various antibiotics will be on livestock, or what effect these substances have on reproduction and livability, or the relationship of antibiotics and utilization of nutrients. At present, studies are in progress on the first two problems, as well as on the comparative efficiencies of various antibiotics.

Several concepts have been advanced as to the possible explanation for the favorable ef-

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fect of antibiotics. One theory suggested is that these reduce the number of harmful bacteria, thus allowing the beneficial species to produce vitamin-like factors. Another theory insists that antibiotics decrease the number of mildly pathogenic organisms in the intestinal tract, thus enabling the animal to get a better initial start in growth. Another school of thought suggests that antibiotics develop such a favorable environment in the intestine as to eliminate competition of animal organism and the existing organisms for essential nutrients. One important fact should be mentioned concerning the major difference in the physiological activity of vitamin B_{12} and antibiotics. According to USDA work, B_{12} is carried over from mother to offspring, while antibiotics are not.

Research at several experiment stations has generally demonstrated growth stimulatory effects of aureomycin, streptomycin, terramycin, and penicillin in swine rations. However, some conflicting results which have been reported on the beneficial effects of penicillin on pig growth may be partly explained on the type of ration and the level of penicillin fed. At present, the value of terramycin, aureomycin, bacitracin, and penicillin fed at the same level of 10 mg. per lb. of total pig ration is being compared. The Hormel Institute has reported also that a 0.005% level of a phenylarsonic acid derivative stimulated pig growth, but that higher levels produced a toxicity along with growth stimulatior

Adding B_{12} and Antibiotics to Pasture Rations

Farmers and feed manufacturers have repeatedly asked the question as to what effect a B_{12} antibiotic feeding supplement will have upon hogs full fed on pasture. During the past summer, two groups of weanling pigs were started on alfalfa pasture and fed to market weight to study the above question. The pigs were fed free choice on shelled corn, soybean-oil meal, and a mineral mixture. Ten percent of mineral was added to the soybean-oil meal to reduce overconsumption of the protein concentrate. The basal-fed pigs which received no feeding supplement gained 1.79 lb. daily and required 354 lb. of feed per 100 lb. gain. The addition of 3% B_{12}-aureomycin supplement to the protein supplement (calculated to be 0.4% B_{12}-aureomycin supplement in the total ration) increased the average daily gain to 2 lb. and reduced the feed requirement to 338 lb. per 100 lb. gain. The supplemented lot was fatter, as indicated by their high back fat index at the close of the trial. From these data, it appears that a B_{12}-aureomycin supplement, and presumably other similar supplements, will increase growth rate of pigs fed on alfalfa pasture.

Adding B_{12} and Antibiotics to Different Protein Supplements in Dry Lot

The question as to what benefit B_{12} and antibiotics would have in pig supplements containing large amounts of animal and fish products often has been raised. A dry lot experiment was conducted on 45-lb. pigs self-fed shelled corn, a protein concentrate, and minerals. The protein concentrate made up of 50% soybean-oil meal, 40% meat and bone scraps, and 10% alfalfa meal, was fed free choice to two lots. The addition of a 3% B_{12} antibiotic feeding supplement to the above protein con-

centrate in one lot increased the daily gain about 23% and decreased the feed requirement about 5% over the basal lot. Even the addition of the B_{12}-antibiotic supplement to a high protein supplement composed of 40% soybean meal, 20% meat and bone scraps, 20% Menhaden fish meal, 10% cottonseed meal and 10% alfalfa meal, significantly improved the growth rate and feed efficiency. These data indicate that a ration containing a large percentage of meat and fish proteins is deficient in factors of the APF complex which are essential for rapid growth and a low feed requirement.

B-Complex Vitamins in Dry-Lot Rations for Pigs

Earlier work at the Illinois station indicated that the addition of riboflavin to a plant protein ration for pigs generally improved their performance in dry lot. More recent work at the Michigan station demonstrated that the supplementation of a mixed animal and plant protein ration with calcium pantothenate, riboflavin and niacin improved the daily gain significantly; prevented the occurrence of deficiency symptoms, such as goosestepping; and reduced the feed required per unit gain from 22 to 25%. The Michigan workers also presented evidence that deficiencies of niacin, calcium pantothenate, and riboflavin were involved in producing symptoms of a so-called nutritional enteritis in pigs grown on Michigan farms. This form of enteritis in pigs as described by the Michigan workers was cured effectively by intraperitoneal injections of the three B-vitamins followed by B-vitamin supplementation in the feed. On the other hand, Purdue veterinarians have failed to show any favorable response of B-vitamin supplementation or injection in pigs infected with transmissible gastroenteritis.

It seems apparent that the efficiency of vitamin protection and therapy in intestinal disorders is directly related to the type of enteritis involved or described in pigs and that the three B-vitamins cannot be used indiscriminately as a panacea for all types of enteritis in pigs. Perhaps a safe assumption is that a well-nourished pig is less subject to various kinds of infection because of greater natural resistance built up by proper nutrition. The fact that some of our fastest growing pigs in the past summer experiments were mildly infested with worms supports the above assumption.

During the past summer at the Purdue station, a pig study was conducted on the supplementary value of the above three B-vitamins in a dry lot ration composed of corn, Purdue supplement no. 5, which is a high quality mixture of meat, fish and plant proteins, vitamins A and D, and a B_{12}-aureomycin feeding supplement. The pigs on the basal ration gained 1.76 lb. per head daily on a feed requirement of 386 lb. per 100 lb. gain. Adding 0.8 mg. riboflavin, 4.5 mg. calcium pantothenate, and 5 mg. niacin per lb. to the above high quality natural ration including B_{12} and aureomycin increased the average daily gain to 1.93 lb. (10% increase) and reduced the total feed requirement to 336 lb. per 100 lb. gain (13% decrease). Single additions of either riboflavin or calcium pantothenate to the above pig ration failed to improve growth and feed efficiency markedly.

These results suggest a synergistic action between the three B-vitamins for maximum performance in dry lot. B-complex deficiency symptoms, including diarrhea, were not observed in any of the lots. These data indicate that even when pigs are fed the best combination of protein supplements in a grain ration fortified with vitamins A and D, a B_{12}-antibiotic supplement, and minerals, the addition of the three B-vitamins will exert a favorable effect on growth and feed efficiency.

B_{12} and Antibiotics in Ruminant Nutrition

The use of antibiotics in the rations for a cow or sheep must be thoroughly studied because of the possible detrimental effects of the substances upon rumen bacteria which are so vital in ruminant nutrition. Balancing a ration for the ruminant is essentially balancing the diet for the bacterial microorganisms in the rumen.

A limited amount of research has been done on antibiotics in ruminant nutrition. Oklahoma investigators have shown that feeding 0.2 gm. of aureomycin per steer daily produces a mild anorexia and diarrhea, and reduces the digestibility of crude fiber 50% and of dry matter 15%. Higher levels of the antibiotic produced even greater ill effects on these animals. The pronounced effect on digestibility of nutrients strongly suggests that antibiotics inhibit the cellulytic microorganisms in the rumen. Louisiana studies have indicated that a B_{12}-aureomycin supplement to an all-plant protein ration for 14-week-old dairy calves stimulated their growth rate for about the first six weeks, after which the stimulatory effect seemed to wear off. In another trial, injection or oral feeding of B_{12} failed to stimulate the growth of well-managed dairy calves from 28 days to 126 days of age. However, Kansas workers have shown greater gains and less scouring in dairy calves from birth to 42 days with feeding a 3 gm. cap-

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sule of B_{12}-aureomycin supplement per 100 lb. live weight daily.

At the Texas station, feeding 100 mg. of aureomycin daily to lambs caused them to go off feed and to lose 0.16 lb. daily. The bacterial counts made on rumen contents indicated that the aureomycin had destroyed certain strains of bacteria, thereby eliminating a normal competitive environment and permitting less desirable bacterial types to develop. The supplemented lambs also had shorter and weaker wool fibers. Penicillin and streptomycin additions to the lamb fattening ration produced similar unfavorable effects.

At present it does not seem advisable nor sound to feed antibiotics to ruminants. These substances and vitamin B_{12} may eventually prove to be beneficial in the rations of young calves or lambs before the rumen is fully developed.

Nutrition of the Unborn Pig

Extensive studies have been made in the United States to determine the factors responsible for high mortality loss in newborn pigs. A five-year study at Purdue University on 1,000 pigs that have died at or shortly after birth has revealed that the fundamental cause of their death was due to some nutritional deficiency during their fetal life. Recent swine research has indicated that the life cycle of the pig can probably be divided into four critical nutritional periods; namely, pregestation, gestation, lactation, and weaning to 75 lb. Pigs properly nourished in the first period reflect favorably on the critical requirements and performance of the pigs in the subsequent nutritional periods. Careful consideration must be given to the storage and "carry-over" effects of the critical nutrients in sow nutrition if optimum nutrition of the pig and reduction of pig mortality are to be achieved.

Alfalfa Meal and Green Pasture in Gestation-Lactation Rations

During the past five years, workers at Purdue have studied various practical swine rations to try to determine factors required for optimum gestation-lactation performance in swine. Gilts fed on corn-soybean meal rations fortified with minerals and vitamins A and D, during the entire gestation period, have in most cases raised only 50 to 55% of their pigs. The inclusion of 15% high quality alfalfa meal in the above plant ration has in several tests increased the weaning percentage to 80 or 85%. However, in the 1949 experiment, gilts fed 15% alfalfa meal weaned only 49% of pigs farrowed. Apparently, high percentages of alfalfa meal are not always dependable sources of all of the necessary factors for proper nutrition *in utero*. Evidently we have been unable thus far to take the pasture into the dry lot because in all cases gilts that have had free access to alfalfa pasture during the winter have weaned a higher percentage of their pigs. Green growing legume pastures contain the essential factors for optimum gestation-lactation performance and, therefore, green pasture should be an integral part of the year-round feeding program for sows and gilts.

B_{12} and Antibiotics in Pregnant Sow Rations

During the past two years, research men have strongly suggested the possibility that B_{12}, and perhaps the antibiotics, are two of the nutritional factors required for optimum performance of pregnant gilts and sows. Recently a Purdue study was completed on various supplements fed with a basal ration of corn, soybean meal, 15% alfalfa meal, minerals, and vitamins A and D to pregnant gilts. Twenty-five percent of the pigs born from the gilts on the basal ration died within the first three days, while similar gilts receiving 2 mg. of B_{12} activity per 100 lb. of basal ration lost only 10% of their pigs. Combining vitamin E with B_{12}, in a third treatment, did not improve the results. In the fourth treatment, the gilts fed 2% condensed fish solubles farrowed smaller pigs, but they possessed good livability as evidenced by a death loss of only 10%, which is essentially the same as the losses in the B_{12}-supplemented lot. The gilts fed the basal ration weaned only about 56%, while the different supplemented lots weaned from 71 to 77%.

Vitamin B_{12} appears to be one of the components of the APF complex which is essential for improving the livability of pigs. The Missouri station has also shown that the addition of 10 micrograms of B_{12} per lb. to a basal plant protein ration, plus the three synthetic B-vitamins for gilts in dry lot, improved the weaning weights and weaning percentage. However, this increased sow performance did not quite equal that from feeding fresh cut, green rye as a supplement to the sow's gestation ration; thus, indicating that fresh green feed contains nutritional factors in addition to B_{12} necessary for optimum reproduction.

Oklahoma workers have reported that B_{12} plus aureomycin afforded considerable protection to sows and pigs exposed to an infectious type of enteritis. Furthermore, the Hormel Institute has been able to produce 10-lb. heavier pigs at weaning time by feeding 2 gm. of

aureomycin per 100 lb. of creep ration to suckling pigs, and 0.5% B_{12}-antibiotic feeding supplement to practical sow rations during the latter part of gestation and through lactation. The part of antibiotics in proper sow nutrition is very promising, but it is believed that the long-time effects on sows and gilts must be thoroughly studied before their true value in the ration can be ascertained.

It should be stressed that a balanced ration is one that furnishes the essential proteins, vitamins (both known and unknown), minerals (major and minor elements), and energy (T.D.N.) in the proper proportions for maximum growth and reproduction in livestock. In addition, animals must be fed an adequate ration built around pasture and green feeds throughout their full life cycle in order to obtain maximum and efficient production. Of equal importance in livestock production is proper attention to management, breeding, sanitation and disease control.

▼ ▼ ▼

Treating Foot-rot in Cattle†

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In herds where foot-rot is prevalent, the proper approach is to establish and eliminate the cause. Frequently this is difficult.

The necrophorus bacillus which causes the condition is found in the cecum and alimentary canals of swine and other species of animals. Foot-rot generally develops in animals that are kept on filthy surroundings or wet, contaminated yards. Draining and filling in wet spots or cleaning up loafing sheds and yards will help to lessen the incidence of infection. Slaked lime placed in a shallow box so that cattle walk through it appears to aid in controlling the spread of the disease. Lime-sulfur or copper sulfate solutions used in a similar manner have proved effective also.

The causative organism gains entrance into the tissue through wounds in the skin produced by mechanical injury or bacterial action. It is equally important, therefore, to eliminate from yards and walks sharp-edged stones or other irritating material that may cause even the smallest cuts or bruises of the soft tissues.

Intravenous medication with sulfonamides largely has replaced the more laborious task of picking up the foot and administering local treatment. Routine intravenous therapy without careful examination of the affected foot, debridement and cleansing, however, is not considered good practice. Often a little trimming of the claws and local applications of an astringent antiseptic bring about healing more rapidly and effectively than other forms of treatment.

There are a number of satisfactory preparations for local application for foot-rot. The solution successfully employed by the writer is made up as follows:

℞

Formalin	50 cc.
Liquefied Phenol	60 cc.
Water ..... q.s. ad.	500 cc.

Sig:—Apply to affected parts.

When the infection is destroyed, the application of a suitable healing oil is indicated. If the affected area is exposed to filth, bandaging is advised. A very satisfactory and inexpensive bandage is made from an ordinary burlap sack*. This bandage will wear off, but if properly applied will not come off.

The Burlap Sack Bandage

To cut the bandage, lay a sack on the floor or flat surface with the seam to the right and the bottom nearest you. Using postmortem shears, make the first cut about 7 to 8 in. from and parallel to the seam at the right. Now cut the seam off the bottom of the large remaining

(*Continued on page* 270)

†Presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

*Dr. Harry Caldwell, Wheaton, Ill., should be credited for the design of the bandage used.

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The Parenteral Use Of Water And Salt Water†

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IN making up this title, the difference between water and salt water is emphasized, which difference will be made apparent in the following discussion.

The water in the body represents about 70% of the body weight; but it does not exist in the body like water in a jug. It exists in very definite compartments, and there are specific physiological laws which control the shift of either salt or water from one compartment to another. Physiologically, body water may be divided into the following three compartments: the blood, which contains about 6%; the interstitial fluid space, which contains about 22%; and the rest of it, more than 70%, is held within the tissue cells.

Intracellular water means water in the cells; water in the blood needs no further explanation. However, interpretation may be needed of the term "interstitial water." This is simply water not in cells nor in blood vessels. Every portion of the body water transferred between the blood and cells must pass through this interstitial fluid space.

When changes occur in water or salt content of the body, they occur first in the blood, whether it is in the direction of depletion or addition. If water or salt is lost, it is, of course, lost from the blood. If it is gained, it is absorbed into the blood first, from where it must pass through the interstitial fluid space, and finally into the cells. Thus, an excess of water may be present in the blood before a similar excess is noted in the cells. The duration of a state of water excess or deficit will determine whether all three compartments are involved, or only one. However, it should be emphasized that adjustments are rapid. This is a labile, dynamic process, so the variation between the three compartments is usually not great.

In the dog, each 24 hours, water equivalent to about 5% of the total body weight is taken in and lost. That represents almost as much as the total amount of water existing in all the blood in the body. If this were all lost from the blood, and it was not supplied again from the interstitial space, a fatal hemoconcentration could develop quickly. However, as everyone knows, a dog not being exercised can go 24 hours without water, easily. Actually, if one would measure the total blood volume and total volume of water in the blood, one would not be able to show any definite decrease. It would be made up by a shift from the interstitial fluid, which, in turn, would be replenished from the intracellular fluid.

The amount of water that can be lost before definite clinical signs are observed varies somewhat with the environmental state and rate of loss, but, in general, one can say that if an amount equal to 6% of the total body weight is lost, definite clinical signs will appear. In hot weather, a loss of 12% may be fatal. In cool weather, up to 20% may be tolerated before death occurs.

Function of Body Water

Where is the water lost from the body? Why is such a large turnover necessary? The major loss occurs in the urine and water evaporated for the purposes of eliminating heat from the body. Of these two, that lost by evaporation is much more variable. A minimum water requirement for urinary excretion does not vary appreciably. In normal, healthy individuals, a minimum would be about 10 cc. per lb. per 24 hours. That does not mean that normal animals do not produce more urine than that, but they could get along on that amount.

In cases of illness, particularly in chronic diseases; old age; in animals which have suffered injuries, either accidental or surgical; animals which are deeply depressed, such as those under anesthetics; or those which have suffered a relatively severe dehydration, more water for urinary excretion is needed because these patients are less able to concentrate urine. It is important to realize that most patients are not normal, or they would not be under treatment, and that their requirements deviate from normal. Whenever there is any interference with the kidney functions, it is always toward the direction of inability to concentrate urine and, therefore, more water is necessary each 24 hours to eliminate the total solids.

The greatest variability, however, occurs in that amount of water required for evapora-

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tion or loss of body heat. This varies greatly because the heat production of the body can vary several hundred per cent between an animal at ease and one under violent exercise; and also, environmental temperatures vary. When the environmental temperature reaches 92 F. and above, all heat loss occurs through evaporation, rather than through other means, such as by radiation and convection. Therefore, as the environmental temperature rises, more and more water must be supplied for evaporation in order to eliminate heat. On a hot day in the sun, it is not only necessary to eliminate the heat produced in the body, but actually heat is absorbed into the body by radiation which must be lost by evaporation; a 300 or 400% increase in the water requirement for evaporation alone may occur.

Water and Salt Intake

The salt and water content of the body, in spite of these variations in requirement, remains constant in normal health. The variation of the concentration of salt in the body fluid varies only slightly, and the total amount of water and the total amount of salt bears a very close relationship to the weight of the animal. This is controlled by a relatively simple means when it works; that is, by the simple mechanism of taking in more than is needed of both salt and water and excreting the excess. The mechanisms which control the intake are thirst and appetite. Normal thirst and appetite will result in taking in more water and salt than is necessary, and the kidney does the job of retaining what is necessary for other purposes and excreting the excess. The kidney function itself is controlled in a more complicated manner by two hormones; the antidiuretic hormone of the posterior pituitary gland and the cortical steroids of the adrenal cortex. This is a rather long story in itself. The kidney does not function as an automatic machine. It functions as a living organ under control of these hormones.

Water and Salt Balance

When animals are injured or sick, or when they become old, the simple mechanism described above may fail and not be dependable. This may take place in two ways. It may break down in being faulty in intake; the patient does not drink enough voluntarily, and appetite is lost, so a deficit occurs simply on the basis of deficient intake. A deficiency may occur in the ability of the kidney to retain a sufficient amount of fluid. If this organ is unable to excrete its normal amount of solid excretion products in a certain volume, it will tend to increase the volume. There will thus be an increased loss of fluid, which may be greater than the normal intake. Frequently in sick patients, both things happen together. The kidney is unable to concentrate and puts out more dilute urine, and, at the same time, the patient loses his thirst and drinks less.

The possible pathological states that can occur from faulty regulation of water and salt balance are: an increase in salt or water or both, or a decrease in salt or water or both, or in a combination of these things. Since we are now concerned with the administration of salt and water, we shall limit our consideration to the deficiency states. By deficit, reference is made to a decrease in the total amount of salt or water or both. It is also possible to have relative decreases. For instance, if an increase of water occurs without an equal increase in salt, there may be a relative salt deficit even if the total body salt is unchanged. A pure salt deficit is rare in man and also in pets which are fed scraps and other feed in normal rations. Practically always a large excess of salt is ingested.

Water Deficit

In speaking about a water deficit, it would be well to point out some of the ways in which this may occur; some of these are obvious and some are not considered as often as they should be. The first one, for instance, is unavailability of water. This varies with the condition of the patient. Water may be adequately and readily available to a healthy animal and still not be readily available to a sick animal. When a patient is sick, weak and debilitated, it simply does not make much effort to do anything and will not make much effort to get a drink of water. Water should be readily available for all sick animals so that a minimum of effort is required to obtain a drink.

Physical disability may prevent drinking. That is common and sometimes not realized, but fractured jaws, abscessed teeth, foreign bodies in the tongue, and many such things may deprive an animal of water when it is available and thirst is present.

One cause of water deficit of which we have become aware only recently is central nervous system depression. This must be looked for particularly following surgery, when the heavily narcotized patient goes through a period of 24 or 48 or 72 hours in which there is a rather marked depression of the central nervous system. These animals do not mani-

fest normal thirst, considering the water deficit they are suffering. In other words, one cannot depend on their normal thirst mechanism to get an adequate supply, and these are the cases which must be watched and treated by parenteral fluids.

Persistent vomiting, of course, can result in a water and salt deficit in a short time. These individuals lose fluid in the actual vomitus and, in addition, are not able to drink and retain water or food. They can go down to a marked deficit in six or eight hours.

The four causes of water deficit mentioned above are deficiencies in intake. Such a deficit may also be produced by excess loss. In severe exercise on a hot day, loss of water may actually be greater than the capacity to drink and absorb it. Deficiencies develop rapidly under those circumstances. Actually, a simple water deficiency without a concurrent salt deficiency is usually an acute situation. If the water deficit is only a small amount every day, and it is accumulated over a period of time, the kidneys will excrete the salt equivalent to the water lost so that the concentration remains constant, and actually the deficiency becomes a salt water deficiency and not a water deficiency. That is an important point to remember, as in these cases giving water will not cure them. They need salt water.

Diagnosis of Water and Salt Water Deficiency

The diagnosis of water deficiency is sometimes difficult to make. One might think the patient needs some fluid, but one does not know whether to give water or salt water. Certain clinical differences between these two states are shown in table 1.

The third point in table 1 is a good distinguishing characteristic. In water deficiency, patients are excitable, restless, and show incoordination, staggering gait, and will not lie quiet. In the last stages, of course, they may be in coma. In salt water deficiency, patients are lethargic, depressed, and inactive.

The treatment of water deficiency is to replace the deficit with 5% dextrose solution if the patient is unable to drink. Since the patient does have thirst, it can often replace the deficit by drinking. How does one know how much to give? A good way to judge is to give enough to get an adequate volume of urine; about 10 to 15 cc. per lb. every 24 hours. Another end point is to obtain a normal urine specific gravity. That is about as good and as easy a way as any. Too seldom is the total urine volume watched, and too seldom is the specific gravity recorded. High specific gravity and small amount of urine in itself can be an indication of whether there is a fluid deficit.

Acute and Chronic Salt Water Deficiency

There are two types of salt water deficiency —acute and chronic. The acute type is usually associated with some other condition, such as vomiting or diarrhea, and the general picture is somewhat different from that designated as chronic. Alkalosis or acidosis is frequently present. If associated with vomiting, it would generally be alkalosis. The chronic type is interesting and less commonly recognized. It occurs from a chronic water deficiency which may be due to inaccessibility, disease, or age. There may be a little deficit in water each day and when this happens, the kidneys tend to excrete more salt than is ingested. The patients then lose salt and water, and this may go on until the total salt water content of the body is markedly deficient. Then the clinical picture described above occurs. There is an acute muscular weakness, depression, and lack of appetite and thirst. If water is offered, these animals will not drink, so one cannot depend upon thirst to effect cure.

TABLE 1. Clinical Manifestations for the Diagnosis of Water and of Salt Water Deficiencies

WATER DEFICIENCIES	SALT WATER DEFICIENCIES
1. Dry mouth and skin with tongue not wrinkled.	1. Dry mouth and skin, tongue wrinkled.
2. Marked thirst.	2. Loss of appetite and thirst.
3. Excitability, restlessness, incoordination.	3. Weakness and depression.
4. Coma in late stages.	4. Low urine output.
5. Low urine output.	5. Alkalosis or acidosis often in acute deficiency.

Treatment of acute salt water deficiency is to judge the amount of loss by estimating the amount of vomitus or estimating the amount of the watery stool and replace that amount parenterally in the form of 0.9% sodium chloride. These animals have developed a water deficiency on top of salt water deficiency, and one must take that into account too; so replace the salt water loss, depending upon the volume of vomitus or stool, then give an equal amount of 5% dextrose. Do not give

these together, but as two separate administrations, two separate solutions. In a chronic salt water deficiency, the patient needs to have his daily water requirement provided him based upon 10 to 15 cc. per lb. body weight for the urine, 7 or 8 cc. per lb. body weight for evaporation. Give about that same amount of normal saline or Ringer's solution. Again these are to be given separately, as two separate solutions.

Choosing a Parenteral Solution

When 5% glucose is given, it is not given for the glucose; that does not amount to much. The total calories are relatively insignificant. It is recommended simply as an isotonic form of water. The dextrose is metabolized, leaving the free water. If one wishes to give calories, it would be better to give a more concentrated solution than 5%; and good results have been obtained using solutions containing a maximum of 15% dextrose. With a 50% dextrose solution, one can actually produce a water loss. If that is not important, 50% can be used. Normal saline or Ringer's solution is given only when one wants to give salt water; it is not given in the place of water. Administering salt water is a poor way of giving water. Refer to table 2. If the kidneys were able to excrete salt so that a concentration of 1.8% appeared in the urine, it would still require 200 cc. of 0.9% sodium chloride (NaCl) solution to supply 100 cc. of water. A salt content of 1.8% represents about the maximum concentration possible. Therefore, generally more than 200 cc. of 0.9% NaCl are needed to provide 100 cc. of water. This is especially true in sick animals, as indicated in the foregoing. If, for instance, the maximum urine concentration of salt were 1.3%, a total of 328 cc. of 0.9% NaCl must be administered to supply 100 cc. of water. Examples are given in table 2.

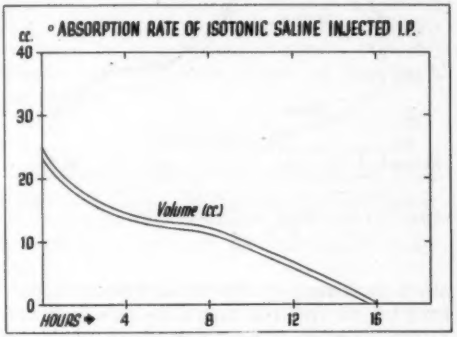
TABLE 2. Isotonic Saline Required to Supply 100 cc. of Water at Various Urinary Salt Concentrations

% NaCl in urine	Vol. urine	Vol. 0.9% NaCl
1.8	100	200
1.4	175	275
1.3	228	328
1.18	320	420
1.07	533	633

If one has decided which solution to use, the next step is to determine the route of administration. This may be oral, subcutaneous, intraperitoneal, or intravenous. In the present discussion, we are assuming the patient is unable or unwilling to drink, so the oral route is omitted. Some may prefer a stomach tube even with such a patient. The possibility of vomiting and aspiration is always a decided danger in unconscious patients.

Administration Routes

Subcutaneous and intraperitoneal routes of administration are much alike in that absorption must take place before the patient derives benefit from the injection solutions. When given intravenously, absorption ceases to be a problem, and for that reason is the preferred route. Just how important a problem is absorption? A recent paper by Webb, Lemmer, and Elman[1] presents some pertinent data on this subject. Figures 1 and 2 are copied in part from this paper.



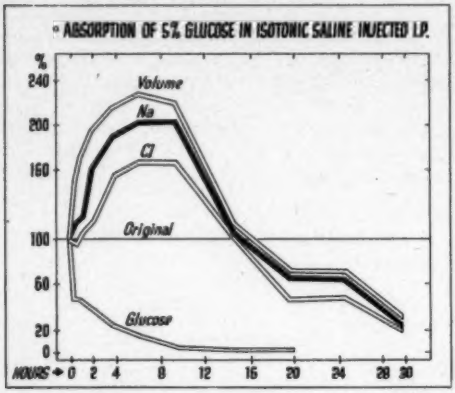
From Webb, Lemmer and Elman. Surgery, Gynecology & Obstetrics, 91:265 (Sept.), 1950.

Fig. 1

Figure 1 shows the rate of absorption of isotonic saline when injected intraperitoneally into a guinea pig. The injected volume is 25 cc., and, as can be seen, it takes 16 hours for all to be absorbed and five or six hours for half of it to be absorbed. On this basis, one would hardly expect immediate results when solutions are given intraperitoneally. Subcutaneous absorption would be at least as slow and likely slower. Certainly, all emergency administration of fluid should be given intravenously.

A solution which has had widespread usage is 5% dextrose in isotonic saline. It is inadvisable to inject such a mixture subcutaneously or intraperitoneally. To begin with, it must be realized that this is a hypertonic solution and, as such, will "draw" water into the injection site until sufficient dilution has occurred to make the solution isotonic. Therefore, the first effect would be to dehydrate the patient. The

result is even more serious than this because as water diffuses into the injection site, so do electrolytes as sodium, chloride, potassium, and calcium. Thus, if the intent were to administer either water or salt, the result is actually a worsening of the salt and water imbalance for the first few hours. As seen in figure 2, this situation lasts for about 15 hours, so only after such a length of time does the patient begin to receive benefit from the injection. From this, one would conclude that 5% dextrose in isotonic saline should only be given intravenously. If, however, one insists on administering both saline and glucose other than intravenously, each should be given in separate subcutaneous sites, or one subcutaneously and one intraperitoneally. Dextrose diffuses much more slowly than water or salt ions, so in addition to water, it results in the passage of ions such as sodium and chloride into the injection site for the first few hours. This, of couse, is not always undesirable, if one is treating an acute water deficit.



From Webb, Lemmer and Elman, Surgery, Gynecology & Obstetrics, 91:265 (Sept.), 1950.

Fig. 2

Summary

When considering the parenteral use of solutions, it is necessary to decide by history and clinical signs if the deficit is of water or salt water. If the former, use a 5% dextrose solution; if the latter, use isotonic saline or Ringer's solution. In choosing the route of administration, take into account the slow rate of absorption from subcutaneous and intraperitoneal sites. Dextrose diffuses very slowly, and injection of it subcutaneously or intraperitoneally results first in a loss of water and salt from the blood into the injection site. A combined solution of 5% dextrose in isotonic saline or Ringer's solution should only be administered intravenously.

REFERENCE

1. Webb, Watts R., Lemmer, Richard A., and Elman, Robert, Absorption Rates, Electrolyte and Volume Changes Following Subcutaneous and Intraperitoneal Injections of Solutions Containing Salt, Glucose, and Amino Acids. *Surg., Gynec. & Obst.*, 91:265 (Sept.), 1950.

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Treating Foot-rot in Cattle

(*Continued from page* 265)

portion of the sack, unfold and refold at right angles to original fold. Proceed to cut a many-tailed bandage from this piece. The reason for folding this piece as described is to gain length for the "tails" which will subsequently be used as tie strings.

The bandage is applied with the foot raised off the floor. With the foot dressed and covered with cotton, the remaining piece of burlap sack, approximately 15 x 18 in., is wrapped around the foot and the no. 1 piece fitted over the foot and tied. Then the many-tailed bandage is placed over the foot with the loose ends toward the front of the foot. The tails are grasped by the operator, and holding the bandage tightly in place, the foot is lowered to the floor. In tying the tails, start at the top, joining the opposite pairs with one loop. Then beginning at the top again, tighten the first (upper) pair and place the loose ends so that they will be incorporated with the knot of each succeeding tie. Cut off the loose ends when all the tails are securely tied. Note that the entire bandage is placed below the accessory digits. (See illustration.) The bandage can be prepared and placed on the foot in a matter of a few minutes following a little practice. It works equally well on horses.

To raise the hind foot of a cow or bull, a convenient method is to secure the animal in a stanchion, place a double hitch around the leg above the hock and pull upwards and slightly backwards, preferably with an obstetrical pull with an automatic catch. If the animal is excessively unruly, control its head with nose tongs. The front foot may be held by the herdsman or with a rope drawn over the cow's back or over a beam above the cow. The obstetrical pull may also be employed.

Intravenous Procaine Hydrochloride For Treatment Of Pruritus In Dogs*

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ACCORDING to Lundy[1] and Jones,[2] intravenous administration of procaine hydrochloride was first advocated by Bier in Germany in 1909. According to Graubard and Peterson,[3] Bier also used intra-arterial injections of this drug for the alleviation of pain. Bier's technic was to elevate the extremity, express blood from the part, apply a tourniquet and inject procaine intravenously. The tourniquet prevented the flow of procaine from the part. Relaxation and anesthesia obtained were excellent. With the advent of improved methods of anesthesia, the intravenous injection of local anesthetics was apparently forgotten by most anesthetists until it was discovered by Lundy[1] in 1940 that relief could be obtained from pruritus caused by jaundice in man by intravenous injection of 0.1% solution of procaine hydrochloride.

It is now used extensively in human medicine for the control of a variety of different conditions such as pruritus, alleviation of pain in burns, treatment of bed-sores, allergic manifestations, postoperative pain, cardiac hyperirritability, traumatic and inflammatory pain. It was also reported by Graubard and Peterson,[3] to be useful in obstetrical anesthesia, embolism, anuria, glaucoma, frostbite, eclampsia, and toxic syndrome in infants.

These investigators[3] have treated successfully many cases of delayed serum sickness in man, as well as rash which has been caused by delayed penicillin reactions. Some of the recoveries in those cases were said to be dramatic. Beckman[4] also listed intravenous procaine as a drug which will give relief in various hypersensitive conditions, however, he listed epinephrine as a drug of choice in severe immediate anaphylactoid reactions. Jones[2] stated that procaine hydrochloride seems to have been used with the greatest success in the treatment of spastic muscles arising either from trauma or congenital defects and in the treatment of inflammatory conditions such as arthritis, neuritis and bursitis.

According to Graubard and Peterson,[3] the intravenous use of procaine hydrochloride has passed through the stages of enthusiasm and skepticism and is now on the threshold of acceptance based upon laboratory and clinical evaluation in man.

They wrote that procaine has been more intensively and extensively studied and tested than any other drug used in medicine. There seems to be a universal agreement that this drug is less toxic than cocaine or any of its substitutes.

Pharmacology

Procaine is rapidly eliminated by the body tissues particularly by acetylization in the liver. Graubard and Peterson[3] cite Dunlop as having proved that it did not significantly affect the liver.

There is seen occasionally in man, an individual sensitivity to this remedy. The writer has been unable, in a search of literature, to find references to such individual sensitivity in animals. Such a possibility may, however, be considered. The test used in man is an intradermal wheal being raised with 1 cc. of 1% solution of procaine. In sensitive persons there is a marked local reaction within ten minutes. A similar test may be of value in veterinary medicine.

To date, Graubard and Peterson[3] have given over 4,000 intravenous procaine infusions without serious complications. They relate two instances of momentary unconsciousness but at no time has the use of sedatives, oxygen, or restorative drugs been necessary. According to these authors there are no contraindications to the intravenous use of this drug, except myasthenia gravis and individuals on digitalis or digitalis-like therapy.

Procaine hydrochloride has a marked tendency to stimulate the central nervous system, resulting in hyperexcitability or in convulsions. There is apparently considerable individual variation and susceptibility to this stimulation. Jones[2] found the minimal lethal dose in rapid injection experiments in dogs to be between 100 and 105 mg./kg. of body weight.

Goodman and Gilman[5] stated that the extreme susceptibility to the central nervous system stimulation which procaine may produce

*Presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

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is controlled by the use of barbiturates. They advised the routine administration of a sedative prior to its use; the barbiturates being preparations of choice.

The writer could find no references in veterinary literature to the clinical use of intravenous procaine in animals. As far as is possible to determine, Dr. L. Meyer Jones, of Ames, Iowa, (*Vet. Med.*, 46:93 [Mar.], 1951) has done the first and only extensive laboratory research in veterinary medicine on its intravenous use as an anesthetic agent in dogs. Because of the variable individual susceptibility of dogs, his conclusions did not indicate this as being a practical anesthesia. He reported that the analgesia resulting from the intravenous injection of procaine was irregular in occurrence and lasted only a few minutes.

Practical Use of Intravenous Procaine

Itching caused by various skin diseases in the dog has been one of the primary concerns of veterinarians. The discomfort caused by this itching has certainly been an anxiety of owners. It is not at all infrequent for an animal to be presented at the hospital with a history of having "scratched himself raw."

Wolff and Wolf[a] have suggested that itching is a variant of pain being carried on the same nerve fibers but apparently induced by stimuli of intensity below the threshold of pain. It is possible, however, for the torment of itching to be even more excruciating than pain.

Itching is induced in dogs by various parasites, fungi, allergies, and systemic diseases. Manifestations of this vary from occasional scratching and biting at feet to skin excoriation. In such instances, the animal is unable to rest and on occasion the distress is severe enough to cause hysteria and convulsions.

Procaine hydrochloride first was tried clinically in our hospital for various types of pruritus in the summer of 1949. Since that time, the drug has been used intravenously for the treatment and relief of various types of this ailment. It has been so satisfactory that it is now regularly included in our routine therapy where it is desirable to relieve itching. The writer has administered it to well over 500 patients. The results of these treatments have varied in individuals. Although occasionally the relief from scratching may last just a few hours, the majority of the patients are relieved for periods from five to as long as 17 or 18 days.

The relief from itching is an aid not only in providing comfort to the patients but it also prevents the additional injury which is caused by continuous scratching. The inflammatory appearance of the skin will occasionally subside entirely within 12 to 48 hours following the administration, and recovery is thus hastened.

The treatment has been found to be particularly advantageous in the fall when so many typically allergic dermatitis cases are presented. They are first seen about the middle of August and continue in numbers until two or three weeks after the first frost. Most cases have a typical appearance; red and weepy eyes, and a serous discharge from the nose with small raw patches on the side of each nostril. There may be large raw areas around each eye and on each side of the nose. The animal may also have a reddened thickening of the skin and large erythematous areas over the body. There is a history of continuous scratching and occasional sneezing. Many dogs are presented, however, with just a history of frequent scratching and biting at the feet. The skin may have no visible abnormality, nor is any other cause for biting of the feet detectable. Such cases usually respond to the intravenous administration of procaine. At times, in those cases, there has been no other treatment administered with the exception of antihistaminics. It is usually necessary to repeat the administration about every two weeks.

Although intravenous procaine seems to be specific in occasional cases, it should not supplant treatment directed at the cause of the anomaly.

The writer has administered procaine in the treatment of arthritis and postoperative pain. The results have been encouraging, but the cases have been too few to draw definite conclusions.

The best results have been obtained by intravenous injection via Murphy drip, allowing one hour for administration. Dose recommended is 4 cc. of a 0.1% solution of procaine hydrochloride per pound of body weight. For the double advantage of safety to the patient and convenience to ourselves, administration is preceded by a very light anesthesia produced with nembutal®. The barbiturate prevents dangerous central nervous reactions and also makes possible the administration of procaine without constant supervision by an attendant. In very old or debilitated patients, in which nembutal is contraindicated, demerol®[a] is administered one-half hour prior to therapy. An attendant supervises the administration and pentothal sodium® is kept convenient for control of any undesirable reaction. In the

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®Abbott Laboratories, Inc., North Chicago, Ill.

®[a]Winthrop-Stearns, Inc., New York, N. Y.

more than 500 cases we have so treated, no difficulties have been experienced.

Conclusions

1. Intravenous procaine in 0.1% solution administered by the drip method over a period of one hour is a definite adjunct for the treatment of various skin conditions.

2. For safety to the patient and convenience to the veterinarian, it is advisable to precede intravenous procaine injection with a light anesthesia produced by nembutal.

3. Intravenous procaine may be used to supplement other methods of treatment for pruritus.

Report of Cases

Case 1. On August 20, 1950, a spayed female Fox Terrier, age 14½ years, was presented for treatment. Case history included the fact that this animal had been treated in this hospital for allergy every fall for the past 13 years. Antihistaminics had been of some benefit, but every year from the middle of August until the middle of November, various symptoms of allergy, such as sneezing, scratching, loss of hair around eyes and from various parts of the body, were exhibited. These progressed, with accompanying misery, to extreme involvement. There was a typical serous discharge from eyes and nose, acute conjunctivitis, and large raw areas around each eye. The skin on the chest and abdomen was red, swollen and raw. A tentative diagnosis of allergic dermatitis was made. No attempt was made to determine the sensitizing agent.

The animal was treated with procaine the day of admission. Relief was noticeable immediately on recovery from the anesthetic; after which the dog rested well and did not scratch for two days. Other skin treatment was administered as indicated. Scratching was again observed on August 23 when procaine therapy was repeated. Relief was again noted. Although the animal had not scratched again, it was given procaine for the third time and released from the hospital August 27 with the skin and general appearance much improved. On September 6, the owner reported some scratching. At this time procaine treatment was repeated and other therapy given during a three-day hospitalization period. Examination on November 2 suggested the desirability of further medical care. Procaine was again administered and other treatment given for seven days, at which time the animal was again given procaine, and released from the hospital November 9. It was last seen on December 12, 1950, at which time the owner reported that the dog had enjoyed more comfort that fall than any previous year of its life.

It is considered that the procaine therapy was primarily responsible for the relief of symptoms and general improvement in this case.

Advanced pruritus. Pictured above is the patient referred to under case 1. This is a view taken after completion of treatment outlined. Note scar tissue around eyes. This area was swollen, denuded, and bleeding when procaine injections were started. Large denuded areas, now well hair covered, were noted, according to case card, on chest, nose and shoulder regions.

Case 2. On July 31, 1950, a castrated four-year-old Spitz was presented with a history of biting at his feet and scratching considerably. Examination revealed no detectable abnormalities of the skin or the feet. Coat was in good condition. In this case, pruritus was suspected to be of allergic origin. Procaine was administered and the dog was released the same day. Antihistaminics were prescribed and the owner was advised to return the animal if symptoms were noticed again. It was returned for retreatment on the following dates; August 13, August 22, September 10 and November 8. No scratching nor biting of feet was noticed between these dates. The animal was presented immediately when these symptoms were observed. On December 18, the dog was brought to the hospital with a digestive disturbance. The owner said the dog had not scratched or bitten its feet since the last treatment with procaine.

Case 3. On July 17, 1950, a male Chow, three years of age, was reported as scratching continually and being restless for several days.

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Examination revealed typical spots of moist dermatitis. The animal was clipped and procaine administered. Additional therapy was continued for one week. Following this, no scratching was noticed. The dog was released from the hospital after a second intravenous treatment on July 24, with advice concerning diet and home care. Antihistaminics, vitamins and arsenicals were prescribed. The animal was returned to the hospital on August 13 with a history of scratching for three or four days. The dog received procaine that day and was given a hot lime-sulfur immersion the following day. It was released from the hospital August 15. The owner was advised to continue the prescribed home treatment. The dog was observed on two subsequent occasions. Continuous improvement was noted.

Case 1 was selected because of the advanced state of disease progress and the employment of procaine as a primary rather than supplementary therapeutic agent. Case 2 is representative of animals frequently presented with symptoms of itching but having no detectable abnormalities of the skin. Case 3 is more typical of the intravenous use of procaine as a supplemental agent. It is believed that in most instances the employment of this drug will constitute a useful addition to available agents for the relief of symptoms associated with allergic and crytogenetic dermatoses.

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Might Still be a Good Plan

At a meeting of the Iowa State Veterinary Medical Association (Des Moines, 1895), J. H. Wattles, president of the Kansas City Veterinary College, advocated that in addition to the other requirements for admission to a veterinary college, students be required to sign an agreement to comply with the veterinary code of ethics in case they were permitted to take the course and were graduated.

Revised Poultry Grading and Inspection Program Effective July 1, 1951

Following review by hearings held in May of this year, the USDA has announced that effective on July 1, 1951 revised regulations will govern the inspection and grading of poultry. Proposals published earlier (see VETERINARY MEDICINE, May 1951, page 194) were adopted with minor revisions. Major changes are as follows:

1. In place of present provisions which permit the grading of poultry which has been inspected by non-official inspectors, the new regulations require that only ready-to-cook poultry which has been inspected for condition and wholesomeness by federal inspectors or by inspectors of any other approved inspection system may be graded for quality.

2. State employees may be utilized as inspectors; and inspection operations may be conducted on a cooperative federal-state basis involving the use of lay inspectors as well as veterinary inspectors.

3. All poultry processed as dressed poultry in an official plant must be processed in accordance with the sanitary requirements of the regulations and dressed poultry originating in non-official plants may not be brought into official plants except under certain prescribed conditions where effective segregation of the products can be maintained, and where no further processing of such dressed poultry is carried on in the official plant.

4. All poultry eviscerated in an official plant operating under inspection service must be processed in a sanitary manner and evisceration of poultry without inspection for wholesomeness will be permitted only under certain prescribed conditions which require that an inspector or governmentally employed grader be on duty at all times when plant operations are carried on for the purpose of (a) effecting adequate segregation of inspected and uninspected products, (b) maintaining control of official inspection marks and grading marks and, (c) supervising sanitation in the official plant.

5. In plants utilizing the grading service, a majority of the graders' time must be spent each month in grading poultry for quality on the basis of U. S. standards.

Other changes made in the revised regulations include clarification of the sanitary provisions and an increase in the hourly rate for the performance of grading and inspection service on a fee basis.

Ramifications In The Field Of Medical Mycology†

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THE field of medical mycology is a fertile one for research. It is not the intention of this paper to prognosticate on the problems waiting to be solved in this field. The objective is to pass on some general information that might be of interest and help to veterinary practitioners.

It is possible that the average veterinarian is not interested in the taxonomy of the organisms concerned with mycotic diseases of animals. Interest, as has been explained, is in the methods of diagnosis and treatment of fungus diseases.

Simplification of the many phases of medical mycology has been carried out to an admirable degree in the past ten to 15 years by such outstanding workers as Lewis and Hopper,[2] Conant, *et al.*,[1] and in the revision of Henrici's text by Skinner, Emmons and Tsuchiya[3]. Others workers have also made valuable contributions in this field; however, these men have been leaders in the attempt to simplify diagnostic methods for the practitioner.

Those fungi which are responsible for most of the superficial infections of animals are classified as dermatophytes. These organisms are usually found in relation to keratin, *i.e.*, occurring in the skin, in or on the hairs or hair follicles, or in the nail substance. Such organisms will not generally reproduce and grow within deep organs and tissues. There are other fungi, however, which are able to invade the deep tissues and are seldom found on superficial areas.

Diagnostic Methods

When the practitioner encounters an area suspected of being infected with fungi, his immediate concern is to make a diagnosis so he can proceed with treatment. The most important and best means of diagnosis is a direct microscopic examination of skin, hair, nails, pus, etc., from the infected area. Since the three genera, Trichophyton, Microsporum, and Epidermophyton are identical in appearance in infected nails and skin, this material must be cultured to obtain both a generic and specific identification of the invading fungus. Concern, as stated before, is a diagnosis of the infected area to determine if it is mycotic. The clinician is not interested in the generic and specific identification of the organism concerned. It should be pointed out that a positive diagnosis can be made only after a culture is obtained and identified. Treatment can proceed without positive diagnosis if other factors are indicative. One can obtain some information from the direct examination of the infected material. This can be done by the practitioner with very little knowledge of mycology with the help of references such as those of Conant[1] and Lewis and Hopper[2].

The method suggested by Conant for direct microscopic examination of infected material is simple and requires very little equipment. Material to be examined is collected between two glass slides (standard microscopic slides) which have been previously wrapped in paper and sterilized. Home type pressure cooker sterilization is adequate. To examine nail and skin scrapings or hair, place the material in a drop of 10 to 40% solution of potassium hydroxide (KOH) on the end of a glass slide, apply a cover glass and heat gently over a low flame. The material should clear; if not, add more KOH to the edge of the cover slip and heat again gently.

Upon examination under the microscope, if the material is mycotic, one should see the invading fungus in the form of branching filaments in the skin or nail scrapings. Mycotic hairs show involvement of the hair shaft with spores arranged in chains, either external or internal to the shaft. Filaments can also be seen within the hair shaft.

If culturing is desired, material from the suspected area can be collected in the same manner as for microscopic examination. Such material should be maintained between wrapped, sterile slides for five to seven days to allow desiccation of bacteria. Material is then cut into small fragments and three or four pieces placed short distances apart on each of two or three Sabouraud's glucose agar slants*. Cultures are maintained at room tem-

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*Prepared Media: Baltimore Biological Laboratory, Inc., Baltimore 18, Md.; Difco Laboratories, Detroit 1, Mich.

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perature, and should be held for two or three weeks before they can be considered negative. A certain degree of knowledge and experience with the taxonomy of the dermatophytes is required before identification of these fungi can be accomplished with reasonable certainty.

Another important method that can be utilized by the practitioner for diagnosis of mycotic infections is the use of ultraviolet radiation (Woods' light). The light has its greatest practical application in the diagnosis of infections of the hair. A diagnosis can be established and the progress of treatment may be followed. The basis for this method is that infected areas will fluoresce when observed under the Woods' light**. It must be remembered also that many organic and inorganic substances fluoresce, including nails, keratin, petrolatum, teeth, etc. Material collected from such an area is then examined under the microscope as previously noted and a search made for mycotic elements.

There are additional technics utilized by the medical mycologist for diagnosis of mycotic infections. There is little information available on their use by veterinarians. They are mentioned here for your information.

The use of vaccines in diagnosis is well covered by Lewis and Hopper[2] and Conant[1]. It is felt that trichophytin, a fungal antigen, is specific in that it denotes sensitization by infection with a dermatophyte. Not every patient with a fungus infection is sensitized. Therefore, the test is not always diagnostic.

Animal inoculation technics can be used to establish the pathogenicity of a given strain of a fungus culture. It is used when one is concerned with a deep fungus infection such as histoplasmosis. It may also be used to obtain a pure culture from a mixed culture obtained by isolation from infected material.

There are many other diagnostic tests that could be mentioned. However, most of these require trained personnel and a well equipped laboratory. The cost of such studies makes these tests impractical for veterinary practitioners.

Fungi Pathogenic to Animals

A classification of the dermatophytes on an etiologic basis is unsatisfactory. A single species of a dermatophyte can cause a variety of clinical manifestations in different parts of the body, and the same clinical picture can be caused by dermatophytes of different species.

Classification in this manner was made by early medical men on the basis of etiology. Mycologists, who were trained in the use of the botanical rules of nomenclature, have classified these organisms on a sounder basis. Characteristics used to classify the dermatophytes are macroscopic colony characteristics and microscopic morphology of the organisms.

Microscopic characteristics such as macroconidia size and shape, presence of microconidia, spirals, "favic chandeliers", chlamydospores, etc., are used.

Gross colony characteristics such as color, rate of growth, and appearance, *i.e.*, smooth, waxy, fluffy, irregular, compact, and many others are utilized for identification.

Colony characteristics can be changed very easily by changing the medium on which the fungus is cultured. They can be changed also by varying the incubation temperature and incubating under various degrees of light. All of these factors must be taken into consideration by the mycologist when he is culturing for the identification of a species.

The mycologist often encounters more than one strain of a given species. He must be on guard constantly to avoid "discovering" a new species when he is really dealing with a new strain of a known species.

Special media often are required to bring out the characteristic microscopic structures for the identification of a specie. Many of the dermatophytes (*Microsporum audouini, Trichophyton discoides,* and *T. album*) do not produce distinguishing spore forms on Sabouraud's medium. Recent nutritional studies have shown that deficiencies play an important part in the growth of these fungi and the morphology which they display. It has been demonstrated that yeast extract causes production of macroconidia in cultures of *Microsporum audouini* when it is used in the medium.

Some of the fungi causing mycotic infections of deep tissues have two forms. For example, the organism causing histoplasmosis, *Histoplasma capsulatum,* is yeast-like when cultured in sealed blood agar slants at 37 C., while on Sabouraud's agar at 25 C., the growth is white, cottony with septate, branching, filamentous hyphae. The hyphae support round or pyriform, tuberculate chlamydospores which are characteristic.

Histoplasmosis is a mycotic disease which has been reported in dogs. As in man, the incidence is no doubt more widespread than

**A simple Woods' light may be constructed (Lewis and Hopper[2]) or it may be purchased. Westinghouse Electric and Manufacturing Co., Long Island City, N. Y.; Strobelite Co., New York, N. Y.

the reported cases indicate. As veterinarians become familiar with the symptoms and the methods of diagnosis, more cases will be reported. The medical profession is in need of an effective therapeutic agent for the treatment of this disease.

Another interesting organism to which attention should be called is the pathogenic yeast, *Candida albicans*. This organism has been isolated from the normal mouth, throat, intestinal tract, vagina and skin. It is difficult to attach etiologic significance to the findings of *C. albicans*. However, primary bronchitis, of both mild and severe types, has been caused by this fungus. The extensive use of antibiotics has increased the incidence of infections by this organism[4]. Our new antibiotics are not active against *C. albicans*; therefore, as susceptible organisms are eliminated, the "field" is cleared for the development of this organism. Common sites of infection include the nails, mouth, throat, intramammary folds, groin, vagina and interdigital webs of feet and hands.

Direct examination of sputum, nail and skin scrapings, mucous areas of the vagina and mouth, reveals small, oval or round, budding, yeast-like cells. On corn meal agar, branched, tree-like hyphae with chlamydospores are obtained. The latter characteristic distinguishes this fungus from other yeast-like organisms.

Dermatophytids

Dermatophytids are secondary eruptions as a result of the hematogenous spread of the allergenic metabolic products of a fungus from a primary focus of infection. In an individual with "id" lesions, a primary fungus lesion usually can be found and a fungus can be demonstarted in the primary infection site. A fungus usually cannot be found in the secondary "id" lesions. Such "ids" may follow irritation of the primary focus by trauma or overtreatment. The "id" lesions will clear up if the primary infection site is adequately treated. The fingers and hands are common sites of lesions. A fungus infection of the feet may result in lesions on the hands. These lesions will not respond to treatment unless the primary focus of the infection is cleared. Desensitization by vaccine may be attempted but it must be done with extreme care, because of possible anaphylactic shock.

Treatment of Dermatomycoses

The treatment of mycotic infections of animals is not in the writer's field of specialization; however, generalities can be made. Infected areas should be cleared of secondary bacterial infection by the use of one of the new antibiotics designed for topical application. The area should be made free from debris of organic material, kept dry by the use of dusting powders designed for this purpose, and infected hairs should be epilated manually, if practical. There are all types of fungicidal and fungistatic preparations on the market. Results obtained from them, at best, are irregular. One general recommendation can be made; the strong, corrosive types of agents should not be employed. Overtreatment must be avoided. This practice can be the direct cause of unnecessary secondary complications in the therapeutic management of mycotic infections.

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Stimulation by copulation has a significant influence on the time of ovulation in cattle. Of a test group of 30 heifers, ovulation occurred, on the average, at 7.7 hours following the end point of estrus when served by a vasectomized bull. In those not serviced, ovulation occurred 9.9 hours after estrus.—*Jour. Dairy Sci., Dec. 1950.*

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Acute tympany of the rumen implies a condition in which gas is continually being formed, with little or no relief by eructation, the animal being in some danger of collapse and death. This condition arises only in frothy bloat and in complete esophageal obstruction. Ruminal motility is depressed only mechanically.—*Hugh Begg, F.R.C.V.S., Vet. Rec.*, Dec. *23, 1950.*

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Mastitis is a very serious disease of dairy cattle. The annual loss to dairymen is tremendous. Frequent use of the bromthymol test is recommended.—*USDA.*

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Of the wounded (U.S.) soldiers in Korea, 97% have been moved to the United States by airplane, the quickest and safest way possible.

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The Field Differential Diagnosis Of Some Of The Common Respiratory Conditions Of Poultry†

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IN an effort to present information of practical value to the veterinary practitioner in general practice, the most common respiratory diseases of poultry will be considered from the standpoint of field diagnosis.

While the practitioner is apt to feel that the laboratory veterinarian has certain advantages as far as diagnosis is concerned (and it is true in some instances), the practitioner in the field has a distinct advantage, since he can observe the flock under existing environmental conditions. It is realized that management factors are major problems in losses in poultry flocks, particularly in young birds, and herein lies the advantage for the man in the field over his colleague in the laboratory.

For example, it may be assumed that two clients present problems involving respiratory troubles in their poultry flocks. One has young chicks, the other, a laying flock. How is it possible to arrive at a field diagnosis?

In the first place, there are certain basic history items that are important: (1) the age of the affected birds, (2) when the trouble started, (3) rate of spread, (4) morbidity and mortality, (5) symptomatology, and (6) treatment used to date.

These few questions give an experienced individual considerable information before leaving his office.

The Young Chick Problem

Some respiratory conditions are primarily problems of young birds, whereas others are observed more frequently in older groups. When dealing with two- or three-week-old birds (and those up to six weeks of age), the most likely conditions responsible are: exposure, aspergillosis, pullorum disease, infectious bronchitis, and Newcastle disease (pneumoencephalitis). There are other possible causes. However, it is believed that approximately 90% of such cases will fall in the above group.

Keeping in mind items of history elicited from the poultryman will help to narrow diagnosis into two major groups: (1) the rapid spreading group, (Newcastle disease [pneumoencephalitis] and infectious bronchitis), and (2) the slower spreading, (aspergillosis, exposure, and pullorum disease).

Before going any further on the diagnosis, it is advisable to consider briefly each of the above mentioned conditions.

Exposure. Exposure is just what the name indicates. It usually results from chilling, overheating or overcrowding. There are no lesions which can be considered pathognomonic; however, environmental evidence such as obvious overcrowding, drafty quarters, improper brooding temperatures, etc., plus the autopsy findings of mild enteritis and congestion of the lungs, are suggestive. The practitioner in the field has the advantage in diagnosing this condition. In most cases, only a few birds are sick at any one time. The primary symptoms are depression, respiratory effort (moist rales) and loss of condition. In many cases, the birds appear cold. Control of this is largely one of correcting management; with possible use of a mild spray if respiratory symptoms are acute.

Aspergillosis. This is a mold infection caused by *Aspergillus fumigatus* which is occasionally encountered in young chicks and poults. In typical outbreaks, only a few birds are affected at first; however, if remedial measures are not taken, all may eventually become infected. Symptoms observed in affected chicks are gasping (dry rales as compared to the moist rales noticed in infectious bronchitis and Newcastle disease), depression, listlessness and usually increased thirst. Autopsy of affected birds reveals small whitish or greyish-white, plaque-like lesions approximately 1 mm. in diameter on the air sacs; as well as foci of infection in the lungs and bronchi.

These lesions are characteristic and make field diagnosis easy. Control of this disease requires the removal of all litter, feed, water, and acutely affected birds, and thorough cleaning of the house and utensils. It is also advisable to scrub the equipment with a 1% copper sulfate solution. Some practitioners use a dilute solution of copper sulfate in the drinking

†Presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

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water, but it is doubtful if this is of much benefit.

Pullorum Disease. Pullorum may occasionally produce respiratory symptoms in young chicks. There is usually an unexplained mortality or visible evidence of other lesions associated with this disease. Small necrotic and infiltrative foci may be seen in the lungs in many of these, and close observation will often reveal other lesions associated with pullorum disease (necrotic and infiltrative foci on heart, gizzard wall and in the liver). In addition, there may be a history of obtaining birds from flocks not pullorum-tested.

Infectious Bronchitis and Newcastle Disease (Pneumoencephalitis). These diseases are rapid-spreading, respiratory infections which are somewhat difficult to differentiate during the first two or three days of an outbreak. Both are characterized by sudden onset; a few birds show respiratory symptoms. This is followed within 24 to 72 hours by the majority of the flock showing similar symptoms. Newcastle disease usually manifests itself within a few days with nervous involvement, and autopsy will reveal cloudy air sacs (exudate on the air sacs). Chicks affected with infectious bronchitis may show a slight serous nasal discharge, and upon autopsy reveal small caseous plugs in the bronchi. The nervous symptoms observed in Newcastle disease are absent in infectious bronchitis. As far as treatment of these last two mentioned conditions is concerned, once the disease starts, good nursing and a mild spray are about all the measures that can be taken.

Now to go back to our original case and see what can be done as far as diagnosis is concerned. If the flock owner relates that the condition started suddenly with one or two birds gasping, and then within 24 to 72 hours the whole flock was affected, it would immediately suggest (1) infectious bronchitis or (2) Newcastle disease. If the flock had been sick for three or four days with no nervous manifestations appearing, one should be more suspicious of infectious bronchitis. Autopsy of birds affected with infectious bronchitis may reveal caseous plugs in the bronchi, serous exudate in the trachea, and slight hyperemia of the lungs. Findings of cloudy air sacs and nervous symptoms would be more indicative of Newcastle disease.

If the condition was spreading more slowly, one might consider exposure, aspergillosis, or pullorum. The lesions would be very helpful in differentiating the latter two, and environmental conditions would assist in the exposure diagnosis.

Respiratory Disease in Adult Birds

When birds are older (semi-mature or adults), probable causes of disease will be somewhat different than in young chicks. The conditions to be considered here are: (1) infectious coryza, (2) chronic fowl cholera, (3) laryngotracheitis, (4) fowl pox, (5) infectious bronchitis, and (6) Newcastle disease (pneumoencephalitis).

Infectious Coryza. Infectious coryza, or infectious colds, is a relatively common condition in some of the farm flocks in Ohio. It is usually slower spreading than diseases such as infectious bronchitis or Newcastle disease. This factor is helpful in making a differential diagnosis. In most cases, the first noticeable symptoms consist of a slight serous nasal discharge. Later, this exudate becomes catarrhal and if untreated may develop into a purulent or caseous condition. Actually, from a field standpoint, the owner may notice debri sticking to the nostrils, a slight drop in egg production and evidence of respiratory involvement. Later, swelling may develop in the sinuses about the face and wattles. If the lower air passages are involved, marked respiratory symptoms may appear. Autopsy usually reveals lesions confined to the upper respiratory tract. A general rule which is helpful to keep in mind is, "Any respiratory disease which has a nasal discharge as a constant symptom, affects several chickens at a time, persists in a flock over a period of weeks or months, and especially one which affects the pullets year after year, is likely to be infectious coryza[1]."

This infection responds well to the use of sulfathiazole and this is sometimes used as a field diagnostic agent. If the chronically affected individuals are removed and the sulfonamide started, improvement can be expected within 24 to 48 hours.

Chronic Fowl Cholera. This disease may occasionally produce respiratory symptoms and should be briefly mentioned. In the chronic form, the organism may localize in the sinuses or lower respiratory tract, as well as other parts of the body. Lesions observed consist of a caseous exudate in the sinuses or air sacs. In some instances, the organism localizes in the lungs and a true pneumonia develops. Many of the cases formerly attributed to infectious coryza are now thought by some investigators to be due to chronic fowl cholera. In most cases there is a history of a previous outbreak of acute cholera which is helpful from a diagnostic standpoint. If there is a history of a previous outbreak of acute cholera

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or unexplained losses followed by a few birds with lesions such as described, one would be justified in suspecting fowl cholera. It is a good idea to submit a bird to the laboratory, if this is suspected.

Laryngotracheitis. This condition is relatively rare in our state; at least as far as diagnosis at the laboratory is concerned. It is a relatively acute respiratory infection characterized by gasping, sneezing and coughing. In most cases, the owner will notice a hemorrhagic exudate on the feeders, waterers, roosts, etc. Autopsy reveals a hemorrhagic tracheitis in the early stages, later a brownish, fibrinous exudate in the trachea. When one encounters the above symptoms and lesions, there is not much question as far as a diagnosis is concerned. In addition to the above mentioned symptoms and lesions, mortality is invariably high. This is not true in most cases of pneumoencephalitis and infectious bronchitis. Like every other disease in man or animal, typical cases are encountered occasionally which can be very confusing from a field diagnostic standpoint.

In our experience, an outbreak of laryngotracheitis is invariably associated with the improper use of the vaccine on the flock in question, or the neighbor's flock, with spread to the affected flock. It is realized that on rare occasions the infection can be introduced into young chicks; however, contrary to the activity of Newcastle disease and infectious bronchitis, the losses are very low in young chicks. Control is based upon prevention by vaccination in areas where the disease is prevalent. If an owner has experienced an outbreak, he should continue to vaccinate for several years.

Fowl Pox. Fowl pox is another disease which can and does on some occasions produce respiratory symptoms. The cutaneous type rarely produces death. If the diptheritic type or "wet" form, as the poultryman calls it, develops, the mortality may be quite high. This form of pox will produce lesions on the mucous membrane which often localize in the pharynx, around the opening of the larynx. It can easily be diagnosed, particularly if the cutaneous type is present in the flock, and remedial measures can be instigated early. Control measures consist in vaccination of the remainder of the flock with the pigeon strain of pox virus. Remember, all this trouble can be prevented in future years by vaccinating at the proper age with the standard fowl pox vaccine. In any questionable cases, the diagnosis can be confirmed by examination for inclusion bodies.

Infectious Bronchitis and Newcastle disease (Pneumoencephalitis). These two present a greater problem from a field differential diagnosis standpoint in adult birds than in chicks. As will be recalled, nervous symptoms usually appear in a few days after the start of symptoms in Newcastle disease in chicks. These are absent or rare in adult birds. At one time it was felt that certain factors such as drop in egg production, effect on egg shell quality, etc., were the answer. However, more similarity in these diseases is demonstrated now. An autopsy is of great assistance in making a differential diagnosis since clouding of the air sacs is a more constant characteristic in Newcastle disease than in infectious bronchitis. This finding, together with the fact that the drop in egg production is usually not as great in infectious bronchitis, is helpful in arriving at a field diagnosis. From the standpoint of the infected flock, differential diagnosis is not of major importance, since the treatment is the same in both instances. It would be well to submit an acutely affected bird immediately, or a sample of blood serum a few weeks later, to a diagnostic laboratory to confirm diagnosis, if there is any question. One is thus enabled to advise the owner regarding the handling of the succeding poultry flock.

The Flock Problem

It is important to establish the rate of spread of disease, morbidity and mortality, as well as symptomatology. If the owner advises that the flock revealed respiratory symptoms suddenly and that the spread has been rapid, the conditions most likely to be responsible would be Newcastle disease, infectious bronchitis or laryngotracheitis. If there has been a very low mortality, if egg production dropped suddenly to near zero, and an autopsy reveals extremely cloudy air sacs, one is justified in calling it Newcastle disease, pending a laboratory check. If egg production has dropped about 60% and the air sacs are normal, one would suspect infectious bronchitis. However, if the owner had experienced considerable mortality, mentioned a hemorrhagic exudate, or as he calls it, "blood spitting," one would be suspicious of laryngotracheitis. Remember, however, this last condition is relatively rare and in most cases is associated with the improper use of vaccine.

Let us assume that the poultryman indicated the respiratory trouble had been in the flock for at least four or five weeks, and that he has had similar trouble every year. If examina-

tion reveals a nasal discharge and catarrhal or purulent inflammation of the upper air passages, one should be suspicious of infectious coryza. This is especially true if there is no evidence of previous outbreak of fowl cholera in the flock. A good check for the practitioner is to remove any chronically infected birds from the flock and treat them with sulfathiazole. There should be an immediate improvement in the flock within 48 hours if it is infectious coryza.

If fowl pox is the causative agent, the typical diphtheritic membrane can be found in the pharynx and on the larynx. In most outbreaks there is also evidence of cutaneous pox in the flock.

In conclusion, it should be pointed out that the practitioner is in a position to handle poultry cases and differentiate the various respiratory conditions to a limited degree. A practitioner can do just as good a job in diagnosing poultry diseases as he can swine diseases, if he will take the time to familiarize himself with certain basic facts regarding various poultry diseases.

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Pyelonephritis in Dairy Cattle†

E. A. WOELFFER, D.V.M., Oconomowoc, Wisconsin

Pyelonephritis is fairly common in high-producing dairy herds in Wisconsin. It is found mostly in adult females, but bulls and young stock are occasionally affected. The disease is a chronic infection of the urinary tract caused by the diphtheroid bacterium, *Corynebacterium renale*.

Early symptoms are the passing of blood-streaked urine and frequent attempts at urination, or dribbling. Urine from affected animals has a strong odor of ammonia. When collected in a tube and left standing for a short while, a considerable amount of sediment forms. At first the appetite and milk production are not affected but as the disease advances the animal shows less interest in food, and milk production drops. The temperature generally is normal. Rectal examination in advanced cases reveals a thickened bladder, enlarged ureters and kidneys.

Treatment with penicillin in early cases is effective. For this reason, practitioners are urged to instruct herdsmen to observe early symptoms. Similar results cannot be expected in advanced cases. However, marked improvements following treatment have been noted in a surprising number of such individuals. Economically it is sound procedure to treat selected cases even when the most to be expected is temporary relief. Too many good cows affected with pyelonephritis have had their usefulness cut short by going to the butcher's block too early.

An example of such a case was a valuable purebred, nine-year-old dairy cow. Two months following her last freshening a rectal examination revealed a thick-walled bladder, thickened urethral opening, enlarged kidneys, and greatly enlarged ureters. The right ureter was about ⅞ in. in diameter. Early symptoms before freshening went unobserved. During her lactation period, she exhibited four attacks which were characterized by the voiding of bloody urine, loss of appetite and a drop in milk production. She responded to treatment with penicillin in each instance and finished her production record with 21,000 lb. of milk containing over 900 lb. of butterfat. She carried a fetus during part of her lactation period but had to be destroyed before the next freshening. Penicillin appears to be the most effective drug currently available in the treatment of this disease. Two to three million units of procaine penicillin in oil, injected at 72-hour intervals until three or more doses have been given, produce good results. In mild, early cases, one dose may be all that is necessary, but as a rule it is better judgment to continue medication until three or four doses have been given.

†Presented at the 67th annual convention of the Indiana Veterinary Medical Association, Indianapolis, Jan. 10-12, 1951.

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Only 69% of the approximately 25 billion pounds of meat consumed in this country annually is federally inspected. Only 50% of the eviscerated poultry receives an adequate inspection and, of course, none of the much larger quantity of New York dressed poultry is, or can be, adequately inspected for wholesomeness.

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Farm production of meat animals in 1950 expanded to 42,900,000,000 lb., the second largest volume since 1909. According to the Bureau of Agricultural Economics, this production in pounds was exceeded only in 1943; receipts for these animals set a new record in 1950, amounting to nearly $10,000,000,000.

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The Use Of A New Chemotherapeutic Agent To Arrest Bleeding In Animals

BERNARD S. KLAUSMAN, V.M.D., Jackson Heights, New York

EXCESSIVE hemorrhage in animals has always been a problem to veterinarians since, in many cases, animals are not brought under observation until owners notice definite signs of illness. When examination is made, it may be found that massive internal hemorrhage has occurred and that in order to arrest bleeding, prior to treatment of the animal, some efficient hemostatic agent should be used. Mechanical hemostats only add to the condition of shock in which the animal frequently is found.

It has been the experience also in ordinary surgical cases, certain infections, and in injuries, where hemorrhage is a complicating factor, that a systemic hemostatic agent is of value.

Our attention was called to a preparation which has had considerable success in the field of human medicine. It was decided to employ this agent in a large number of cases.

Koagamin®, which is an aqueous solution of oxalic and malonic acids, has been found to be effective in cases of venous and capillary hemorrhage. McGavack[1] studied its effect in treatment of hemophilia and reports that it has a distinct advantage in cases in which abnormal clotting time of the blood is observed. Herbst and Weinstein,[2] stated that this preparation caused a decided decrease in bleeding and coagulation time, within 30 minutes after injection, and that this decrease was noted over a considerable period of time. Other authors[3,4,5,6,7] have noted similar advantages in the use of this preparation in human patients where there is abnormal bleeding caused by injuries, and during surgery.

Until recently, vitamin K was injected routinely in emergency hemorrhage and surgical cases coming under our observation. Vitamin K, however, is not needed when this newer preparation is used. In patients of known prothrombin deficiencies, vitamin K and koagamin together effect faster control of bleeding.

Methods and Results

The preparation was administered routinely to animals admitted to the hospital where excessive bleeding complicated clinical progress.

®Chatham Pharmaceuticals, Inc., Newark 2, N. J.

TABLE 1. Results of Use on Surgical Patients

Operation	No. of dogs	Average age in years	Weight in lb.	Dosage	Results
Pyometra	13	9	20-30	2 cc. im. preoperatively; 2 cc. in 200 cc. 5% glucose and saline solution postoperatively	Fair
Enucleation of eye (infectious or traumatic)	9	6	10	1 cc. im. preoperatively; 2 cc. in 200 cc. in 5% glucose and saline solution postoperatively	Good
Mammary tumors	26	11	35	Same	Excellent
Dental extractions	48	10	16	1 cc. im. preoperatively	Excellent
Cesarean section	9	6	18	2 cc. im. preoperatively; 2 cc. in 200 cc. 5% glucose and saline solution postoperatively	Good
Miscellaneous adominal (torn spleen, small tumors, foreign bodies, hernia, intestinal resections, calculi of bladder)	40	all ages	all wgts.	2 cc. im. on admission; 1 cc. iv. if indicated	Good

im.—intramuscularly iv.—intravenously

It must be remembered that the usual mechanical hemostats are employed for arteries and large veins whether or not hemostatic drugs are injected.

The following tables indicate the efficacy of koagamin in preventing excessive blood loss in dogs.

It is interesting to note that a Great Dane weighing over 100 lb. (the largest dog in the entire series) was given 4 cc. of the preparation. Later this animal received a dose of 6 cc. and another of 2 cc. There were no side reactions to the large doses given. In fact, there were no untoward side effects noted throughout the entire series. It is the opinion of the investigator that koagamin has a wide margin of safety. Of further interest is the fact that when it was incorporated in 200 cc. of 5% glucose and saline solution for intravenous administration postoperatively it was entirely compatible with the solution. There was no clogging of the needle and the entire solution was free flowing.

TABLE 2. Results of Use in Patients Suffering Traumatic Injuries to Prevent Hemorrhage During Manipulation and Extension

Operation	No. of dogs	Average age in years	Weight in lb.	Dosage	Results
Auto injuries (shock, internal bleeding)	38	1-10	12-60	2 cc. im. on admission; 0.5 cc. iv. hourly as indicated	Good
Body lacerations	36	1-13	10-60	2 cc. im. on admission; 1 cc. iv. hourly as indicated	Good
Fractures	56	1-10	10-65	2 cc. im. preoperatively	Good

TABLE 3. Results of Use in Infectious Diseases

Operation	No. of dogs	Age in years	Weight in lb.	Dosage	Results
Intestinal hemorrhage	68	all	all	2 cc. im. on admission; 1 cc. iv. with 200 cc. 5% glucose and saline solution every 3 hours	Good
Urinary bleeding	42	all	all	Same	Good
Miscellaneous (nose bleeding, ear bleeding, bronchial bleeding, anal bleeding)	70	all	all	2 cc. im. on admission; subsequent treatment dependent upon condition	Good

Discussion

It will be noted in table 1 that the preparation was administered to animals suffering from pyometra, in which only fair results were obtained. It is only just to state that these results could not possibly be otherwise, since this condition is one in which there is a great amount of pus in the uterus of the animals, the blood vessels are engorged and the condition is toxic. In many cases, infection had spread into the abdominal cavity and the animal was a poor surgical risk. The normal mortality rate in this condition is approximately 50%, and it is interesting to note that in the present series this was cut to 35% to 40%. It cannot be stated with assurance that this was entirely due to the hemostatic agent used to prevent further bleeding and hemorrhaging; it is believed that the results reported speak for themselves.

In skeleton fractures, where severe hemorrhage was complicating or a hematoma was present, and especially in compound fractures, koagamin was administered to prevent further hemorrhage during manipulation and extension.

Summary

A large series of cases in which koagamin was administered to prevent excessive bleeding in surgical, traumatic and infectious cases, has been discussed.

In all cases, this preparation was found to be of great value in preventing excessive blood loss where venous and capillary bleeding were complicating symptoms.

No untoward side effects, or incompatibilities were noted. The preparation has a wide margin of safety and can be administered without apprehension. It was further noted that there was no increase in shock in those

(*Continued on page* 285)

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A Mastitis Prophylaxis And Treatment Of Seven Years' Satisfactory Use

J. H. WINTER, A.B., D.V.M., Onsted, Michigan

THE writer's practice, like every other that includes work with dairy cows, is concerned daily with the major problem of mastitis. Everything ever offered as an answer has been tried in this area. These varied treatments have all, probably, done some good, though frequent poor results, high cost, tedious technic and even damaging sequelae have conspired at last to leave no completely satisfactory approach.

Perhaps Hillsdale County, Michigan, is super dairy-plague conscious. It was the nation's first county to undertake the area test for bovine tuberculosis (due to neighbor Howard R. Smith). At any rate, it was a client in this county, a retired physician, who restimulated the writer's interest in vaccination as a weapon against mastitis. This doctor-owner got interesting results in his badly infected herd following the use of homemade autogenous vaccine. In this case, 1% aqueous brilliant green was chosen for attenuation, subjecting organisms for at least 30 minutes.

Autogenous bacterins, variously produced, are familiar to older veterinarians. Grand Rapids men had used Dean Schuh's tea-kettle or cereal-cooker, attenuated infected milk, and the various chemical attenuators advocated by several veterinary schools of the decade just closed. Usually, a mysterious silence ensued following the almost complete ruin of some fine herd by the terrifying flare-up of latent infections induced by these roughly manufactured biologicals. Despite these "roarbacks," it is certain that many fine results were obtained and a period of immunity followed that could have been accomplished in no other way.

So, fired by the physician's brilliant success, we again took up his autogenous bacterin. As was warily suspected by this scarred campaigner, results varied from excellent to no good; even negative in the algebraic sense, when traumatic or other latent infections were roused.

After a series of prideful successes and humiliating failures, some involving threat of legal action, a vaccine that included 30 cc. of the autogenous material and 10 cc. of the best commercial bovine mixed bacterins was settled upon. Mixing, apparently, cooled the rough autogenous material. Nature's alkaline udder therapy was re-enforced by a thorough general alkalizing. This latter effect was achieved by feeding from two to six or more tablespoons of common baking soda ($NaHCO_3$) twice daily. This is best begun three or four days before the vaccination, and should be continued for a total of two or more weeks. Without the accurate records that should have been kept, it appears that this combination is most effective against the quarters already infected and that the alkalizing seems to have minimized the exasperatingly large abscesses that sometimes develop at the point of bacterin injection. In fact, it has been a long time since we have seen vaccination abscesses, except in a Jersey herd where the entire dose of 40 cc. was unwisely injected at one site.

For seven years the present procedure (outlined below) has brought us more friends, dollars and sense of solid accomplishment than anything else we have done.

Dual Vaccination and Alkalizing Prophylaxis and Therapy for Infectious Mastitis

1. Check each quarter in the herd, using the first stream of milk, with brom-thymol test cards. This rapid test is roughly accurate. The first milk is slightly more sensitive than that drawn later.

2. Place the wet cards on a paper towel or similar neutral surface. Whitewash, urine, feces, etc., may produce a false reaction.

3. Read in about five minutes. This period will allow the fainter greens to develop. Hold to sunny window or light bulb to facilitate reading.

4. With green stockyard wax or carpenter's chalk, or better, the startling red wax so effective especially on black and white animals, indicate the infected quarters by marks on the hips above the infection. Marks may be proportioned to the apparent degree of involvement. These marks guide the operator as he collects material for the autogenous bacterin. They dramatically illustrate to the owner or herdsman the riddled condition of the herd and point out the need for action.

5. Any convenient container of known capacity may be used in harvesting the milk; mason jar, milk bottle, or perhaps best a graduated quart, or handy baby formula pitcher; the latter for sale at most any drug store for 50 cents. It is best to include two-year-old heifers freshening within six months and to draw an ounce for each cow or heifer to be treated, with a couple of ounces "for the pitcher." This allows for possible wastage, slimy dregs, etc. Roughly, so as to approach a proportionate composite, draw about the same amount from each infected quarter as far as practicable.

6. Add 1 cc. of 1% aqueous brilliant green for each ounce of the milk, stir well and let stand for 30 minutes.

7. Using a 40 cc. hypodermic syringe with needles of medium coarseness, draw 10 cc. of the commercial and 30 cc. of the autogenous bacterins.

8. Inject about 20 cc. in each of two sites on both sides of the upper neck base, in the inverted triangle remaining available as the cow lunges forward against the stanchion. This recommendation is made to prevent laming soreness and for the operator's convenience. Abscesses rarely occur. Their development is due to high Staphylococcus count. Owner should be prepared for their appearance but is usually disappointed. It is well to masssage thoroughly the injection site.

Inclusion of the commercial bacterin, despite its weak provision against non-streptococcic invaders, seems to bolster the occasionally weak autogenous material, that may be due to the small number of infected quarters available and those shedding a low count.

As noted, soda should have been fed for three or four days before treatment and be continued for a total of two weeks or more. Injection abscesses and infected quarters are favorably affected by this alkalizing. Without the soda, too, there have been bad remote effects, such as the flare-up of traumatic abscesses.

The writer is aware of the crudity of diagnosis and therapy here. Many sound objections may be leveled at the procedure. However, in the barn it justifies itself with interestingly high efficiency, stopping the spread of the infection and apparently "curing" a high percentage of the quarters already infected. The process should be repeated at six-month intervals. Cost is under 25 cents per immunization.

In some herds, amazing to the new operator, no quarters remain showing the familiar signs of infection. In other herds part or all of the infected quarters are not favorably affected. For these, the author has found nothing better for economy, polyvalent efficiency, dispensing quality and general satisfaction than the following, which moreover cannot be bought at the feed or drug store.

Put first through flour sifter and then into wide mouth gallon jug:

Sulfanilamide	12 oz.
Sulfathiazole	12 oz.
Sodium bicarbonate	12 oz.
Iodized oil q.s.	1 gal.

Stir and shake well. Thorough remixing is required before dispensing in rubber capped 125 or 250 cc. serum type bottles.

Forty to 80 cc. may be injected into each non-acute quarter because this formula is not highly irritating. Nevertheless, sulfanilamide and soda orally are used on acute cases before injecting. Leave the injection in the quarter over one milking, with occasional upward massage to overcome gravitation.

The iodized oil is made by the familiar addition of a dram of resublimed iodine to a gallon of heavy white mineral oil. Placed in a warm location and shaken frequently, it "makes" in a few days. If speed is desired, treat the iodine with ether, ½ oz.

Repeatedly, because of the polyvalence of this formula, the writer has restored badly infected quarters to a satisfactory negative status, even when the owner was not interested in vaccination, and had previously used various antibiotics.

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New Chemotherapeutic Agent to Arrest Bleeding in Animals

(*Continued from page* 283)

animals than might have resulted if our past surgical procedures had been employed. Because of the fact that this preparation minimizes bleeding from veins and capillaries, the surgeon has less need for topical hemostatics. This provides a clearer and less cluttered field in which to work.

The drug has proved to be useful in everyday practice.

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EDITORIAL COMMENTS

Downward Trend in Tuberculosis Death Rates in 30 Countries

A general decrease in deaths from tuberculosis since 1945—a decrease in some places "verging on the dramatic"—is reported by WHO in a study covering 30 countries on all continents. This study, entitled Tuberculosis Mortality: 1937 to 1949, has been made by Dr. John B. McDougall, Chief of the WHO Tuberculosis Section, and was published in a recent issue of the WHO Epidemiological and Vital Statistics Report. Although the study indicates an improvement in the general tuberculosis picture, Doctor McDougall points out that mortality rates should be considered only as a broad index to the seriousness of the problem.

The most striking feature of the story is the spectacular post-war fall in death rates from tuberculosis in a number of European countries engaged in hostilities between 1939 and 1945.

France with rates as high as 134 and 128 per 100,000 inhabitants in 1941 and 1942, respectively, has shown startling improvement in the past several years. The death rate for France had fallen to 68 per 100,000 inhabitants by 1949.

The report states in the case of Italy, that recovery has been "in some ways one of the most impressive in Europe."

Denmark is the only country among those covered by the report which attained a mortality rate as low as 19 per 100,000 by 1949. Denmark, according to the WHO report, is "heading for the last laps" in its effort to control tuberculosis.

Portugal and Spain, two non-participating countries in World War II, maintain, together with Finland, the highest death rates from tuberculosis among European countries included in the WHO report. But, while the Finnish rate is falling, this does not yet apply to Portugal and Spain.

A general decline in mortality rates from tuberculosis in recent years by comparison with pre-war years is also indicated in the WHO study. Only two countries, Portugal and Scotland, indicate an opposite trend. On the other hand, New Zealand, Denmark, the Netherlands and the United States, which had already reached remarkably low rates before the war, have succeeded in reducing still further their rates by 30 to 39%.

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Early Days in the BAI

When federal meat inspection was established, it was required that the inspectors be veterinarians, but they were not required to qualify for appointment by passing a civil service examination. This was soon changed and in 1894 examinations were held for applicants for the position. Thirty-one took the examination; three passed.

This "choosyness" was characteristic of the federal BAI from its inception (seven years before meat inspection was inaugurated). The first appointees, the non-civil service group, included many who were, or developed into, national leaders in the veterinary profession. Among such, one thinks of D. E. Salmon, A. D. Melain, A. M. Farrington, Victor A. Nörgaard, E. A. DeSchweinitz, Charles Wardell Stiles, F. L. Kilborne, V. A. Moore, Theobald Smith, Cooper Curtis, E. C. Schroeder, William E. Cotton, O. E. Dyson, Sesco Stewart, George C. Faville, Charles Keane, Tait Butler, Albert Hassal, and Marion Dorset.

Of the much larger number who entered the Bureau via a civil service examination in the following six years, a greater than average number, although a smaller proportion, attained national prominence either for services within the Bureau or after leaving it. Among the former, one recalls John R. Mohler, J. S. Buckley, George W. Pope, J. A. Kiernan, S. E. Bennett, W. B. Niles, I. K. Atherton, and U. G. Houck. Among the latter may be named A. G. G. Richardson, Louis A. Klein, J. H. McNeil, Burton R. Rogers, L. P. Cook, and C. E. Steel, all of whom became deans of veterinary colleges. A. A. Holcombe and L. E. Day were secretaries of the A.V.M.A. Doctor Day also served the U. S. Livestock Sanitary Association as secretary-treasurer. The number who left the Bureau and succeeded in practice and in veterinary commercial work was large, as was also the number who became instructors in veterinary colleges.

When it is recalled that the total number of veterinarians employed in the Bureau from its organization till the end of 1900 was only 281, it is apparent that the selection of personnel was skillful.

Rabies Outbreak in the Northwest

The first outbreak of rabies since 1941 occurred in Spokane, Wash., in March, when a positive diagnosis was made on a dog. Nine dogs and two cats were proved positive in subsequent weeks. A widespread, voluntary vaccination program and quarantine have localized the outbreak and although some five additional positive cases are reported as occurring in recent weeks, the disease in this section appears to have been controlled.

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Diagnosis of Vibriosis in Cattle

Reasons for suspecting the possible presence of vibriosis in a herd are, according to Dr. W. N. Plastridge (*Vet. Ext. Qrtly. No.* 122, Pa. Univ., April 3, 1951), the occurrence of abortions, especially in animals in the first six months of gestation, and a poor conception rate. Periodic pregnancy examinations assist greatly in supplying presumptive evidence of vibriosis. When this disease is suspected, fetus (when available) and blood from aborted cows, and the genital tract of cows slaughtered because of sterility, should be sent to a laboratory for study and confirmation of diagnosis by the identification of *Vibrio fetus.*

French a Keen Observer

Just in case readers are inclined to think allergies in man due to animal contacts are a discovery of the last decade, they are reminded that Cecil French, then conducting a small animal practice in Washington, D. C., reported such an occurrence nearly six decades ago (1895). This was a case in which the owner of a dog suffered a violent attack of rhinitis whenever he permitted the animal to sleep with him; an attack that subsided almost as quickly as it developed, when the owner and dog were separated.

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Cortisone from plants is the subject of intensive search.

A cortisone project has been developed as a cooperative investigation of three government agencies to collect samples of plants for analysis to determine kind and amounts of steroids contained which might be synthesized into cortisone. It is considered possible that this research could lead to a new crop, grown specifically to produce a precursor of one of the latest wonder drugs.

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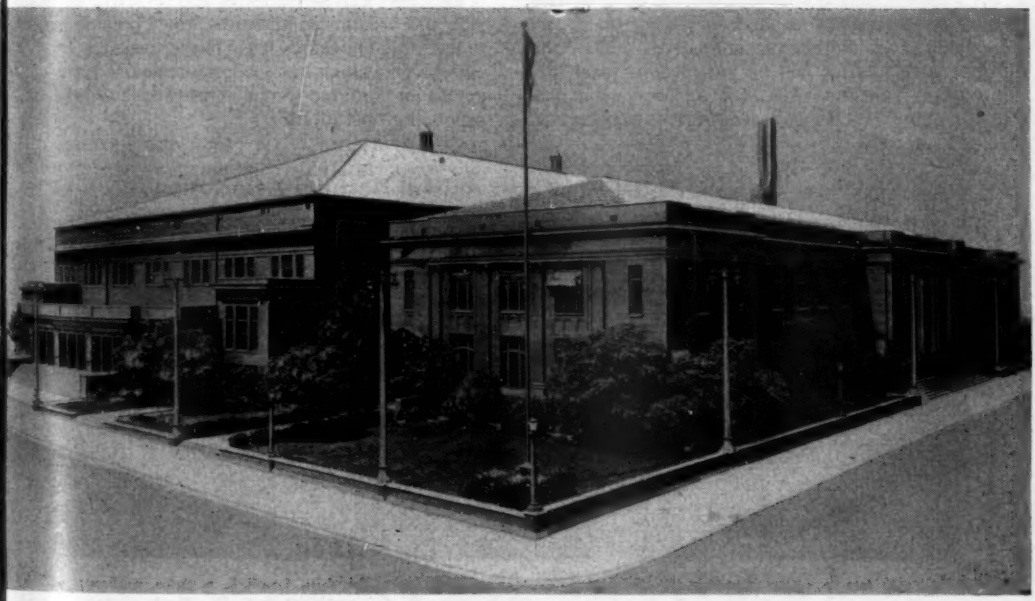
Sanitation is to swine practice what asepsis is to surgery.—*W. A. Aitkens, D.V.M.*

Milwaukee Prepares for the A.V.M.A. Convention



Milwaukee Auditorium—Headquarters; sessions and exhibits of the 88th annual convention of the A.V.M.A. will be held in this spacious building on August 20-23, 1951.

MICHIGAN STATE UNIVERSITY LIBRARIES

Grant to Veterinary Research Institute

The Associated Serum Producers, Inc., sponsors of the American Foundation for Animal Health, announce the allocation of a long term grant in aid to the Veterinary Research Institute of Iowa State College, Ames.

The purpose of this grant (financial) is to launch research on problems related to hog cholera virus.

The research project will embrace short range problems of immediate importance and long range basic research on the immunological aspects of this disease of swine.

General supervision of the project will be carried out by the director and associate personnel of the Institute. A committee of veterinarians from the staffs of sustaining member companies of the Associated Serum Producers will act in an advisory capacity in the development of the program.

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A.V.M.A. Golf Tournament

The annual golf tournament to be held in conjunction with the A.V.M.A. convention is scheduled for Thursday, August 23, at 2:00 p.m. at the Lincoln Hills Country Club in Milwaukee. There will be divisions for constituent association teams, individual members, students, commercial representatives, and a "blind bogey." Prizes will be awarded for each division. The huge A.V.M.A. championship team trophy will be awarded to the winning two-man, constituent association team. Any association can enter one or more teams, but pairings must be announced before tee-off time.

Entries should be submitted to Dr. G. J. Marold, 735 W. Clybourn, Milwaukee, Wis.

There will be a greens fee of $1.50 and the usual entry fee for the blind bogey division.

Following the tournament a German-style buffet supper with liquid refreshments will be served for all participants. Following the buffet supper, the prize winners will be announced and prizes and trophies presented.

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Parasites lead the list of animal plagues from the standpoint of dollar losses to the grower of livestock. A conservative estimate of $418,000,000. is given as the total annual loss due to a group of 20 important diseases and parasites by Dr. F. R. Koutz (The Speculum, 4:6 [Winter] 1951). Of important diseases due to infectious agents or parasites, internal parasitism of all classes of livestock is responsible for the greatest annual loss estimated at $125,000,000. External parasites of poultry caused an additional $85,000,000. and cattle grubs $65,000,000. loss annually. These three leaders cause more than one-half of all damage done to herds and flocks in the United States in a single year.

Defenses against parasites and effective control and treatment measures are available to reduce this enormous loss. These livestock enemies (parasites) must be controlled if growers are to continue to realize profit from meat-producing operations.

New Officers of the American Animal Hospital Association

From left to right: secretary, Dr. Wayne H. Riser, Skokie, Ill.; president, Dr. Ralph E. Ruggles, Moline, Ill.; past president, Dr. J. Raymond Currey, Washington, D. C.; president-elect, Dr. Myron Thom, Pasadena, Calif.; treasurer, Dr. Arthur R. Theobald, Cincinnati, Ohio. Dr. Louis A. Corwin (not present when photograph was taken) was selected as vice-president.

CLINICAL REPORTS

Correction of Bovine Dystocia by Cesarean Section and Ovariohysterectomy

V. L. THARP,* D.V.M., KERMIT R. HEIDT,** V.M. IV, and ROBERT G. WHITEUS,** V.M. III, Columbus, Ohio

The patient, a four-year-old cow, was admitted to the Veterinary Clinic, December 1, 1950, with the following history:

The parturition date as figured by the normal gestation period should have been November 24, 1950; symptoms of labor were first observed November 30, 1950. On this date, a vaginal examination by the ambulatory clinician revealed the tail of the fetus protruding from a tightly constricted cervix. Dystocia due to breech presentation of an emphysematous fetus was diagnosed. The cow was sent to the Veterinary Clinic for cesarean section.

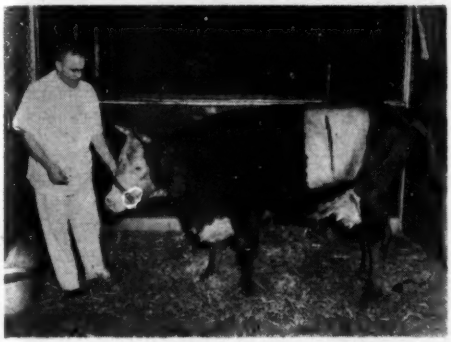

Fig. 1. Four-year-old grade cow six days after ovariohysterectomy. This patient was presented for cesarean section to remove a decomposing fetus. So advanced was the state of devitalization of the uterus that complete removal of the organ was considered necessary.

Upon arrival at the Clinic, the patient was showing symptoms of straining, had a fetid vulvar discharge, but was in a fair general condition.

The operation was performed in the standing position. The only means of restraint was a rope halter. The left flank area was clipped, shaved, and scrubbed with soap and water. Seventy per cent alcohol was used to dry the area, followed by the application of tincture of merthiolate. The operative area was properly shrouded. The skin, muscles, and peritoneum along the line of incision were infiltrated with 2% solution of procaine hydrochloride, containing 1:50,000 epinephrine hydrochloride. An incision approximately 16 in. in length was made through the skin, muscles and peritoneum. Attempts were made to elevate the intact uterus to the abdominal incision but these efforts proved futile; therefore, an incision adequate for delivery was made on the dorsal curvature of the uterus. While removing the fetus, the abdominal cavity was contaminated with fetal hair, uterine exudate and placental debris.

Due to the devitalized state of the uterus, an ovariohysterectomy was considered advisable. The uterine arteries were identified and

Fig. 2. Modification of the Kingma method for administration of intravenous fluids used in the Veterinary Clinic at Ohio State University. This Guernsey cow is receiving a 5% solution of dextrose slowly (one gallon in four to eight hours) and continuously as indicated.

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**Veterinary Students, College of Veterinary Medicine, Ohio State University, Columbus.

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ligated in the broad ligament about 2 in. from the uterine wall. The broad ligament and uterine vessels were severed with scissors. The posterior portion of the uterus was ligated by placing staple sutures through the wall of the body of the uterus, 3 in. anterior to the cervix. The uterus was then severed anterior to the line of suture ligation and the ovaries and uterus removed. The serous edges of the stump of the uterus were closed with the Czerney-Lembert inverting suture. A small portion of the omentum which was contaminated with fetal hair was removed. The peritoneum and fascia of the abdominal muscles were separately sutured. The skin was approximated with a series of no. 3 linen mattress sutures. All buried sutures were no. 4, 20-day chromic catgut.

Immediately following the operation, 2,000 cc. of whole citrated blood was administered intravenously. In order that 5% dextrose solution might be administered slowly at a rate of one gallon in four hours, a small plastic tube (transflex) was inserted into the jugular vein for a distance of about 8 in. in a downward direction. A 12-gauge needle was used as a cannula for venipuncture for this insertion. An 18-gauge needle was inserted into the end of the plastic tube for a connection to a simplex injection outfit. The plastic tube was left in the vein for the entire course of treatment. An occasional occlusion of the tube between injections was easily removed by a small amount of sodium citrate, injected with a 10 cc. syringe. One gallon of 5% dextrose solution was given every eight hours until 9 gal. had been administered. Five grams of streptomycin were given every eight hours for four consecutive doses. The animal was back to normal feed on the fourth day following surgery and began to gain weight and was soon ready for salvage.

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Early Bovine Pregnancy

M. PARKER, D.V.M., Fayetteville, Arkansas

On April 10, 1951, a Jersey heifer, shown in the accompanying illustration, and owned by Mr. O. T. Williams of Greenland, Ark., was reported to be showing signs of approaching parturition.

Upon responding to a call for assistance, it was apparent that the genital tract was too small to allow manual exploration and cesarean section was performed immediately. A normal, apparently full-term, bull calf, resembling a Hereford, was delivered. The calf was weak, but responded promptly to blood transfusion and palliative treatment. The heifer retained the placenta and suffered symptoms of obturator paralysis, but made uneventful recovery as evidenced by the photograph with her calf taken three days postpartum.

The interesting and unusual feature of this case concerns the age of the heifer. According to records of the Arkansas Artificial Insemination Association, this heifer's dam was inseminated on July 23, 1949, from which resulting pregnancy the heifer shown was born on April 20, 1950. This gestation period was shorter than the optimum given by most authorities as ranging from 279 to 288 days.

No breeding date on the heifer was recorded. If the lowest optimum number of days (279) is taken for gestation period, the heifer was pasture bred before reaching three months, and calved ten days before she was one year of age.

Fleming states that heifers are reported to have been bred as early as five months of age, though puberty in cattle is usually stated to commence at 12 months. Fleming also cites a record from the first volume of *Lancet* (1835-36) in which a two-month-old quey (heifer) calf copulated with a bull calf less than three months of age, and gave birth within nine months to a normal calf.